JUL 6 1910 13

LIBRARY OF CONGRESS JUL 8 1910 PERIODICAL DIV

JOURNAL OF ELECTRICITY

POWER AND GAS

Devoted to the Conversion, Transmission and Distribution of Energy

Entered as second-class matter May 7, 1906, at the Post Office at San Francisco, Cal., under the Act of Congress March 3, 1879

VOL. XXV NO. 1 | SAN FRANCISCO, JULY 2, 1910 | PER COPY, 10 CENTS

Henshaw, Bulkley & Co.

ENGINEERS

Machinery Merchants

San Francisco: 19 - 21 Fremont Street
Los Angeles: 262 So. Los Angeles St.
Oakland: 1436 Fifth St.

OKONITE WIRE

OKONITE TRADE MARK REG. U.S PATENT OFFICE.

The STANDARD for RUBBER INSULATION

Okonite Tape, Manson Tape, Candee Weatherproof Wire, Candee (Patented) Potheads.

The Okonite Company

253 BROADWAY, NEW YORK

CENTRAL ELECTRIC CO., Chicago, Ill. F. D. LAWRENCE ELECTRIC CO., Cincinnati, O.
NOVELTY ELECTRIC CO., Philadelphia, Pa. PETTINGELL-ANDREWS CO., Boston, Mass.
ROBBINS ELECTRIC CO., Pittsburg, Pa.

PARANITE TRADE MARK

INDIANA RUBBER AND INSULATED WIRE CO.

Manufacturers of Paranite and Peerless Rubber Covered Wires and Cables
Underground Aerial, Submarine and Inside Use
Telephone, Telegraph and Fire Alarm Cables
All Wires are Tested at Factory JONESBORO, IND.

Electric Appliance Company

728 Mission St., San Francisco — Pacific Coast Agents

Standard Underground Cable Co.

MANUFACTURERS OF

COPPER WIRES, CABLES AND ACCESSORIES

FOR ALL SERVICES

PACIFIC COAST DEPT. First National Bank Building, San Francisco
Sub-Office—Los Angeles, Cal.
GENERAL OFFICES: PITTSBURG, PA.
Factories Oakland, Cal., Pittsburg, Pa., Perth Amboy, N. J.
Branch Offices: New York, Boston, Chicago, Philadelphia, St. Louis

Phillips Insulated Wire Co.

PAWTUCKET, R. I.

"O.K." WEATHERPROOF
"PARAC" RUBBER COVERED

COMPLETE STOCKS CARRIED BY
OUR PACIFIC COAST AGENTS

California Electric Co. LOS ANGELES — Electric Appliance Co. SAN FRANCISCO — Western Electric Co. SEATTLE

Specify....

BROOKFIELD GLASS INSULATORS

The Standard

PACIFIC METER CO.

MANUFACTURERS OF

Wet and Dry Gas Meters, Station Meters, Provers, Gauges, Etc.

311 SANTA MARINA BUILDING
California and Drumm Sts. — San Francisco

VULCAN ..... Refrigerating and Ice Making Machinery

MANUFACTURED BY

VULCAN IRON WORKS

Office: 702 Atlas Bldg., 604 Mission St.
Works: Francisco and Kearny Streets — San Francisco

FOR INDEX TO ADVERTISEMENTS SEE PAGE EIGHT

TK1 .E495

ALLIS-CHALMERS CO

High and Low Voltage Lighting Transformers

Allis-Chalmers Lighting Transformers are provided with special auxiliary taps near each end of the primary winding, which make it possible, by a simple change in connection, to obtain either 110-220 or 440-480 volts normal secondary voltage. This feature allows the use of the same transformer for either lighting or motor service, and effects a considerable saving in the transformer investment usually necessary.

Selected Steel

Skilled Workmanship

Substantial and Compact Design

Rugged Construction

High Efficiency

Close Regulation

Moderate First Cost

Low Maintenance Cost

The Cores of Allis-Chalmers Lighting Transformers are non-ageing. They are guaranteed to have practically the same core loss at the end of one year's service as when installed.

"SOLD ON MERIT"

These transformers hold the record for absolutely unbroken service, and are in use in all parts of the country.

Let us send you full information, with list of users.

Atlanta Ga., Fourth National Bank Bldg.
Baltimore, Md., Continental Bldg.
Birmingham, Ala., Woodward Bldg.
Boston, Mass., 50 Congress St.
Buffalo, N. Y., Ellicott Square Bldg.
Chicago, Ill., First National Bank Bldg.
Cincinnati, O., First National Bank Bldg.
Cleveland, O., Schofield Bldg.
Dallas, Tex., Wilson Bldg.
Deadwood, S. D.
Detroit, Mich., Union Trust Bldg.
Denver Colorado, McPhee Bldg., 17th and Glenarm Sts.
El Paso, Tex., 129 San Francisco St.
Kansas City, Mo., Dwight Bldg.
Los Angeles, Cal., 129-131 E. Fifth St.
Milwaukee, Wis.
Minneapolis, Minn., Corn Exchange Bldg.
New Orleans, La., Maison Blanche Bldg.
New York, N. Y., 71 Broadway
Philadelphia, P. A., Land Title Bldg.
Pittsburg, Pa., Frick Bldg.
Portland, Ore., 92 First St.
St. Louis, Mo., Third National Bank Bldg.
Salt Lake City, Utah, Dooly Bldg., 117-119 W. 2nd South St.
San Francisco, Cal., Jackson Bldg., Second and Natoma Sts.
Scranton, Pa.
Seattle, Wash., 115 Jackson St.
Spokane, Wash., Paulsen Bldg.
Toledo, O., Ohio Bldg.
Washington, D. C., Evans Bldg.

B 213513

JOURNAL OF ELECTRICITY

POWER AND GAS

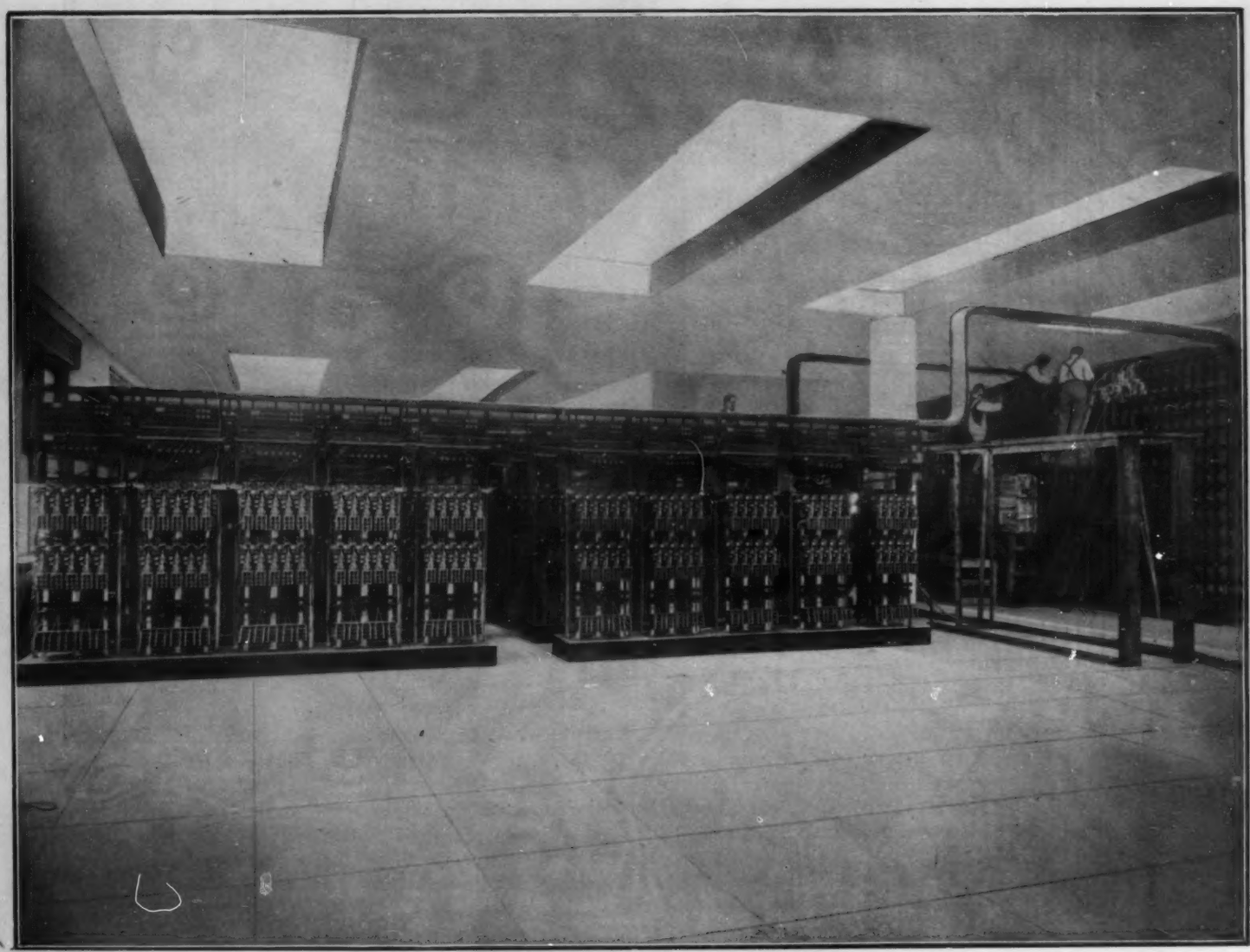
Devoted to the Conversion, Transmission and Distribution of Energy

VOLUME XXV — SAN FRANCISCO, JULY 2, 1910. — NUMBER 1

[Copyright 1910, by Technical Publishing Company]

TELEPHONE ENGINEERING AROUND THE GOLDEN GATE[1]

BY ARTHUR BESSEY SMITH.



Automatic Switching Equipment in San Francisco Office of the Home Telephone Company.

S. M. 11/1X/14

The requirements to be considered in designing a telephone system for this region may be briefly stated as follows:

1. A system which shall give satisfactory telephone transmission between all points in the whole territory.

2. A system which provides satisfactory accessory conditions such as ease, rapidity and accuracy of completing and controlling connections, methods of charg-

[1]Abstract of paper presented at the 27th Annual Convention of the American Institute of Electrical Engineers, Jefferson N. H., June 27-30, 1910.

ing for service and means for discrimination in the same.

The consideration of these general requirements as applied to the case in hand causes their expansion into ten conditions, viz.:

1. Quiet, clear, transmission over all talking circuits.

2. Easy, quick and accurate completion of local connections within each exchange district.

3. Provision for the cosmopolitan nature of the population especially regarding the diversity of languages.

4. Measure service.

5. Free service on calls to certain classes of stations.

6. Private branch exchange business.

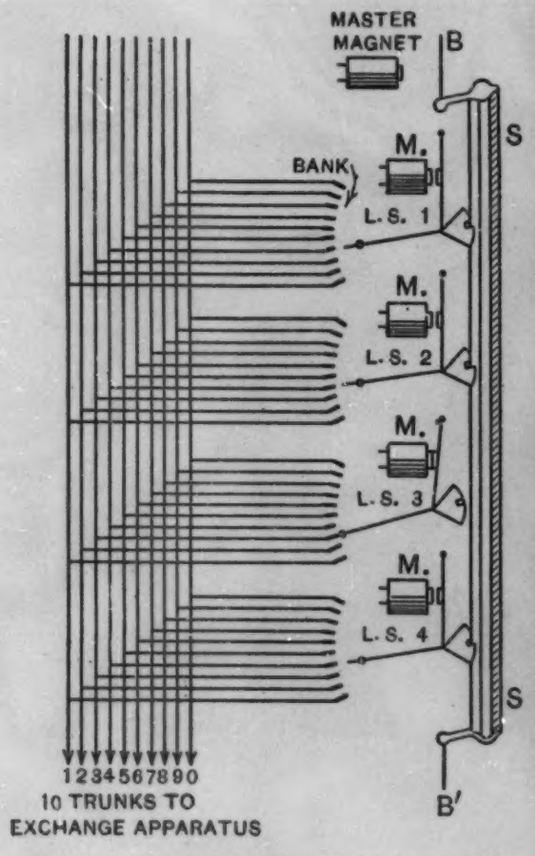


Fig. 2. One Hundred Individual Line Switches.

7. Quick and accurate completeion of calls between exchange districts, especially between San Francisco and Oakland.

8. Accuracy in charging the accounts of credit toll users.

9. Credit and cash toll work between exchanges.

10. Provision for the harmonious mutual working of different types of apparatus used in the several exchanges.

In the Spring of 1905 the interest of San Francisco citizens was aroused by a small exhibit of the automatic system. This exhibit was, however, destroyed by the fire in the Spring of 1906. While the city was recovering from the effects of the disaster the attention of constructionists was diverted to Oakland, where an automatic system was installed and completed in May, 1907. It is of the three-wire trunk release common battery type, with Keith type line switches. Three offices are in service, Main, East and Berkeley, with two district stations connected to the Main office.

Work was again taken up in San Francisco, with the result that a system was installed in 1909. By the time the San Francisco order was placed the two-wire automatic equipment had been perfected and was accordingly used. Four offices are at present operating and are designated as Main, Howard, South and West.

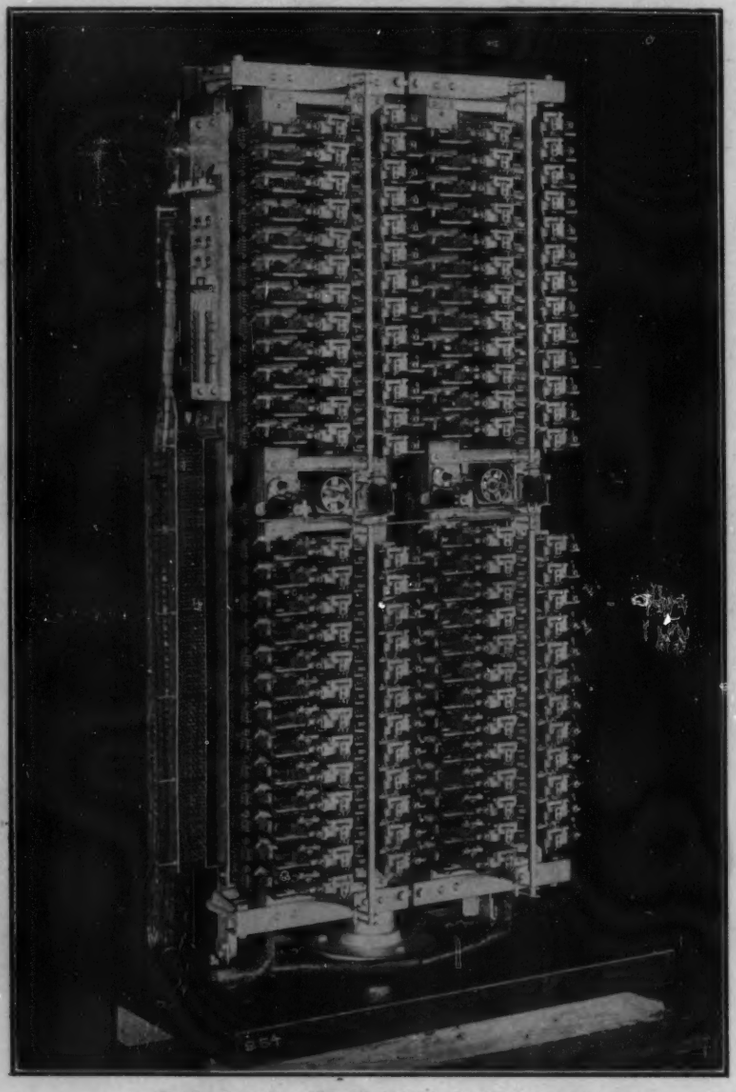


Fig. 3. Grouping of Line Switches in San Francisco Offices.

Local Exchange Apparatus.

Each Oakland subscriber's line in any office terminates in a line switch. These line switches are grouped in units (see Figs. 2 and 3) of from 50 to 100 each. All the line switches in a unit have access to a group of ten trunk lines. The general arrangement of switches is shown in Fig. 4. When any subscriber initiates a call, his line is automatically connected to an idle trunk line, a. This trunk is preselected, so that

there is no loss of time, the connection being practically instantaneous. The various groups of ten trunks each, which come from the banks of the line switch units, terminate in first selector switches.

To the first or bottom level of bank contacts in all first selectors in Oakland are attached trunk lines leading to the Main office. The second level has the trunks leading to the East office and the third level those to the Berkeley office. Taking the East office for example, the trunks from the second level are termed local trunks, b, since they run to second selectors in the same office. Those from the first and third levels, however, are outgoing trunks, c, for they run to the other offices, Main and Berkeley. These outgoing trunks go through repeaters, which serve the chief purpose of supplying talking current to the calling subscriber from his own office, while still enabling him to send impulses to the distant office to control the switches.

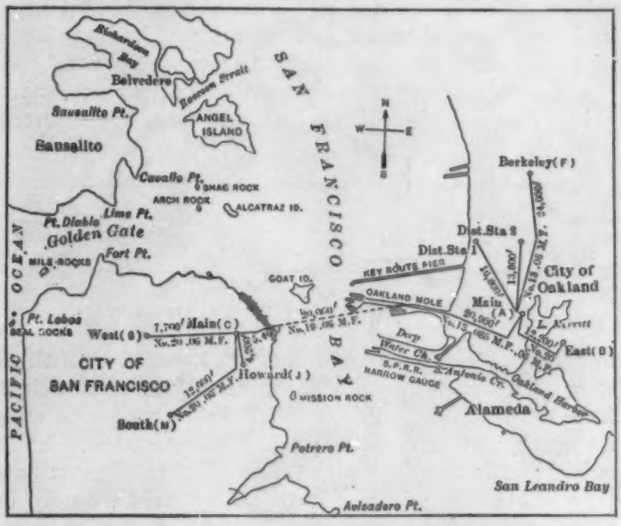


Fig. 1. Map of San Francisco and Oakland.

The second selectors in each office have the duty of picking out the desired thousand group and of selecting an idle third selector in that thousand. The third selector chooses the hundred group and the connector makes the final connection to the line of the called subscriber. In practice the connector switches are mounted on the same frame with the line switches with whose lines they connect. Incoming trunks, d, from other offices are wired to second selectors whose banks connect with trunks common to the local apparatus.

The two line wires which extend from any Oakland office to a subscriber's station are termed "vertical" and "rotary" respectively. In the office each is connected to a relay which has its other terminal attached to a battery of storage cells. The other (positive) terminal of the battery is grounded. The dial or calling device at the sub-station. when operated, grounds each wire in a definite way, operating the relays, and through them the switches.

The vertical wire is the impulse transmitting member, for over it are sent at various times the exact number of impulses required to set the switches according to the digit called. The rotary wire is the switching or circuit-changing member. It determines upon what switch or magnet the vertical impulses shall act. At the close of any series of impulses over the vertical wire, one impulse is always sent over the rotary wire to shift the connections in the switches so that the next series over the vertical line will be effective on the next operation to be performed.

When the called subscriber answers, a relay in the connector is operated which switches the rotary wire from negative to positive battery, thus supplying talking current to the calling subscriber.

The simultaneous grounding and clearing of both vertical and rotary lines causes the switches to be released and restored to normal position.

The grouping of switches in San Francisco is somewhat different from that of Oakland owing to the introduction of secondary line switches. A typical arrangement is shown in Fig. 5.

Each subscriber's line terminates in a primary line switch. These switches are grouped in units of 50

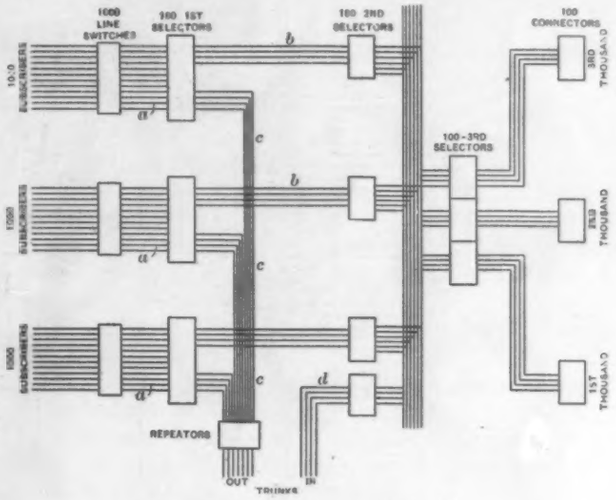


Fig. 4. Trunking in Oakland.

each, and have access to ten trunks, as described for Oakland. But here the difference begins. The trunks from the primary line switches are carried to secondary line-switch units, where each trunk terminates in a secondary line switch. Each unit group of secondary line switches has access to a group of ten trunks, d, each of which ends in a first selector. These secondary line switches are exactly like the primary switches in function, for they pre-select the idle trunks in exactly the same way.

The purpose of using primary and secondary line switches is to enable any subscriber's line to use any first selector switch. This is in the interest of economy. Where only a small number of trunks are available for selection, the efficiency is relatively low. For instance, it has been found in automatic telephone work that ten trunks in one group can be depended upon to handle about 225 busy-hour calls, or 22.5 calls per trunk. Twenty trunks in one group will handle about 575 busy-hour calls or 28.75 calls per trunk. By arranging one hundred first selectors in one group 4000 busy-hour calls may be successfully handled. If arranged in groups of ten each it would take about 180 first selectors to carry the same load.

The intermediate distributing frame placed between the primary and secondary line switches is to render more easy the interconnections by means of which the traffic is equalized on all the first selectors.

Since the first selectors select the office in which the called number is located, all levels but one will be connected to trunks to other offices. These outgoing trunks, c, are led through secondary line switches so that any inter-office trunk is made available to any first selector. For instance, if we consider a call from Main to South, every trunk leading to the South office from Main will be available for use by every first selector in the latter office. By arranging all the trunks in a common group, considerable saving in trunk cable is secured. Though varying with the local conditions, the saving has in certain cases been as high as 40 per cent.

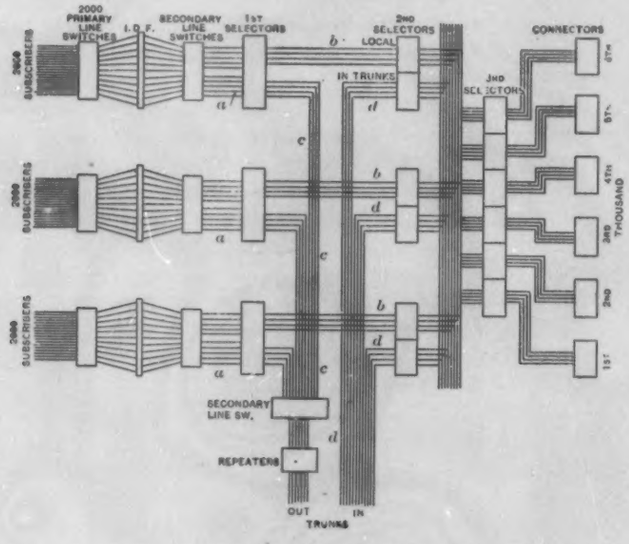


Fig. 5. Trunking in San Francisco.

The incoming trunks, d, from other offices terminate in second selectors which have access, in common with local second selectors, to third selectors. The grouping from here on is identical, in general, with that of the Oakland Exchange, and the connectors are mounted on the same frames with the primary line switches, whose lines they are designed to reach.

The exact method of operation differs radically from that used in Oakland, for the San Francisco apparatus is controlled by the subscriber over two wires with no earth return. This greatly simplifies the subscriber's telephone and gives many structural and operating advantages.

The two subscriber's line wires are known as positive and negative, indicating the terminal of the battery to which each is attached through the windings of the line relay. The series of impulses for stepping up the wipers of the switches is caused by the dial or calling device, which opens and closes a normally closed pair of contacts. The line relay follows these impulses and repeats them to the magnets which move the wiper shaft.

The switching of the circuit to the next switch or operation depends upon the time interval between one series of impulses and the next. During a series, the circuit-changing member is held by a catch, which is released when the impulses cease to come. The release is accomplished by simply opening the line circuit by hanging up the receiver. This momentarily brings into action the release magnets which restore all switches to normal.

Telephone Transmission. The nature of the completed circuit between two subscribers has a vital effect on the quality and loudness of transmission. Freedom from external disturbances is to be secured by properly transposed wires and perfect electrical balance. The former is secured by a large use of telephone cable, the latter by high insulation and properly designed apparatus. In the telephone switchboards installed in San Francisco and Oakland every talking circuit is balanced from one end to the other. Fig. 6 gives in simplified form the transmission circuit between two subscribers in separate offices. From the calling telephone to the called telephone there are four "bridges" or shunt paths. Each of these is a relay or a pair of relays, all of which are highly inductive, so that little loss is occasioned to telephone current. The impedance of each path from line to earth is made as nearly as possible equal to that of the mate. No extra coils are bridged to one side of the line, and none are inserted

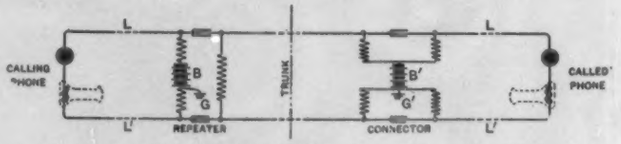


Fig. 6. Simplified Talking Circuit. Inter-office.

in series. All auxiliary circuits are handled by a third wire within each office, leaving the talking circuit clear for its proper functions. The trunks are two-wire with no earth return circuits during conversation. Each subscriber is supplied with talking current from a battery in his own office. No repeating coils are used in any portion of the circuits.

Method of Calling. The method of calling a number on the automatic system briefly consists in rotating a small dial by the finger, making one motion for each digit in the call number. The dial used in San Francisco is shown in Fig. 7. To assist the memory, the offices are designated by letters instead of figures. The code is as follows:

C Main office.
J Howard office.
M South office.
S West office.

Thus, a telephone whose number is 22785, appears in the directory as J-2785. It is served by the Howard office, though this is of little importance to the subscriber.

The manipulation of the dial for an average call number takes about five seconds, after which the bell of the called station begins to ring without further action on the part of the calling subscriber. The ring is intermittent and ceases when the called subscriber answers.

Instantaneous release of the switches is effected by hanging the receiver on the hook. This is of interest chiefly to those who have two or more calls to make in succession.

Diversity of Languages. The method of calling above described is of special convenience to the many people who speak only foreign languages. The Arabic numerals are common to practically all nationalities represented in San Francisco except the Chinese. For the latter a special lettering has been made which is shown in Fig. 8.

Fig. 7. San Francisco Dial.

Fig. 8. Chinese Dial.

Measured Service. One of the conditions met in managing a telephone system in a large city is the desirability of charging for the service in proportion to the amount of service rendered. This is ordinarily done by attaching a meter to each subscriber's line. The requirements of a meter are as follows:

1. It must register only once for each completed connection, rejecting those in which the called station fails to answer.

2. It must make no charge for connection to certain classes of telephones, such as fire, police, information and complaint desks, etc.

The Oakland exchange is operated on the flat rate basis for all calls originating and terminating within the exchange, which includes the suburb of Berkeley. In San Francisco measured service is required.

The meter in an automatic telephone system is attached to the line switch. As above mentioned, it must not operate until the called station answers. Therefore, the latter act must cause some change in electrical condition at the line switch which will cause the meter to register. The line switch of the calling station and the connector which picks up the called line may be in different offices with 1st, 2nd, and 3rd selectors and a repeater in the circuit between. The called station can control the connector and through it the condition of the line leading back to the line switch. Two changes in condition are available, reversal of current and change of current strength. The latter is undesirable on account of its interfering with conversation to stations set aside for free service. The former seemingly necessitates some form of polarized magnet. As it was desired to avoid the use of permanent magnets, a two-coil meter was devised. It is so arranged that when the called station answers, the current supplied to the latter operates the relay which reverses the current supplied to the calling line. This causes the meter to record one call. Neither coil alone will cause registration, and the apparatus has a range from 0 to 1500 ohms line resistance. Its line coil is of low resistance and is short-circuited during conversation. The reversal of current for operating the meter is accomplished in such a manner as not to cause inconveniences to the calling subscriber.

Free Service. Since the connector is the switch in which occurs the reversal of current which operates the meter, the means for giving free service must effect this part of the apparatus. It is done by grouping all free service lines such as information, police, etc., into one or more hundred groups, each group served by a set of connectors. All these connectors are so wired that the current flow to the calling subscriber is not reversed when the called station answers, consequently no register is made.

There is one class of calls for which, strictly speaking, no charge should be made, and that is calls which result in the wrong number being obtained. The meter makes no discrimination here, and if the called station answers, a call will be recorded. However, experience has shown that such a small per cent of wrong numbers are obtained that they may safely be neglected. This is especially true if wrong calls due to carelessness in the use of the dial be omitted. For these it is right to expect the subscriber to pay. The same is true of regular manual practice, for if a subscriber calls for the wrong number and gets it, he is expected to pay for it.

Cash measured service is furnished by means of coin boxes attached to the line wires at the subscriber's stations. No coin is required to be deposited in order to call. When the called station answers, the reversal of current operates a magnet in the coin box which short circuits the transmitter and places a shunt in parallel with the receiver. This prevents the transmission of speech, but allows the user to hear faintly the voice of the called subscriber. By dropping a coin in the chute, the shunts are removed, so that conversation can take place.

When a call is made to a free station as above described, no reversal of current takes place, so that the calling subscriber is not forced to make a payment.

Private Branch Exchanges. In both Oakland and San Francisco the nature of the business makes quite a large number of private branch exchanges profitable to the subscriber and to the operating company. These boards are manually operated and have several trunks connecting them with the nearest public exchange office. Each business house is listed under one number in the directory. When a public subscriber selects the call number the connector switch must automatically select an idle trunk to the private branch board. This is done by a special type of switch known as the rotary connector. It responds to the impulses for the tens and units digits of the call number, but immediately thereafter acts as a selector until an idle trunk is found. These rotary connectors are grouped in hundreds so that in providing for this special service the call numbers are set aside in blocks of one hundred each. Thus in the Main office, San Francisco, the 1100, 1200, 2100, 2200, 3100, 3200, 4100, and 4200 hundred units are set aside for private branch exchange service and no number in them assigned for individual lines.

The trunks to private branch board are treated exactly like subscriber's lines in the public exchange, each being wired to a line switch for calls to the automatic system. They terminate in jacks and signals on the manual private boards and can be used for establishing connections either to or from the subscriber. The operator is provided with a calling device which may be switched by keys to any cord circuit. With this the operator calls into the automatic exchange and

arrangements are made so that complete double supervision is secured on all calls.

In the case of a private branch exchange having sufficient magnitude of business to require it, the trunks leading from connector banks may be made one-way only and reserved for calls to the branch board. There will then be installed as many trunks from the latter to the public exchange as are necessary, these trunks being attached to line switches. The number of trunks is not limited by the number of contacts in a level of the connector bank.

Transbay and Suburban Toll. For the suburban work between San Francisco and Oakland it was thought best to use what is known as the "rapid fire" method. Accordingly provisions were made for allowing the recording operator at San Francisco, for example, to complete the call into the Oakland exchange by a calling device in San Francicso, and to allow the conversation to proceed at once. This virtually makes the recording operator a line operator and entirely dispenses with the services of a line operator to complete the connection in the distant office.

The recording operator is of course obliged to ask the subscriber who originates the call for his telephone number so that the cost of the toll service may be properly charged. It is to be expected that, either by accident or intention, wrong numbers will sometimes be given. To prevent error from this source a system of back checking has been devised.

Two Three-wire Operation. The work of interconnecting the two exchanges was rendered more difficult by the fact that the Oakland apparatus is three-wire, while that of San Francisco is two-wire. The two-wire system requires only the opening and closing of the line circuit. The three-wire system requires each line wire to be grounded in a certain order. The San Francisco recording operator using a two-wire calling device was required to operate three-wire selectors and connectors in Oakland, in some cases as far as thirteen miles away. This was done by means of repeaters which handle the impulses somewhat like a telegraph-repeater, except that it is necessary to transmit impulses only one way.

Each transbay trunk from San Francisco to Oakland ends in multiple jacks with visual busy signals on the San Francisco suburban board, and in a first selector-repeater in the Main office in Oakland. This switch is a first selector, to pick out trunks to the desired office in Oakland, combined with a repeater arrangement to convert the simple make and break of the two-wire system into the alternate grounding of vertical and rotary lines required by the three-wire system. The release of the connection as well as proper supervision is also provided in the repeater.

The operator is provided with a set of plugs and cords with which to connect incoming trunks from San Francisco subscribers to outgoing trunks to Oakland. A calling device is mounted on the keyboard and arranged to be switched into any cord circuit by keys. When a call comes in over an incoming trunk, it is answered by inserting the answering plug of a cord into the proper jack. An idle outgoing trunk to Oakland is selected by inspection of the visual busy signals, and the calling plug of the cord in use inserted into the jack. The calling device is then switched into the cord circuit and rotated in accordance with the desired number. This operates the switches in Oakland.

The release of the three-wire Oakland apparatus calls for the momentary simultaneous grounding of the vertical and rotary lines. The two-wire first selector repeater at the Oakland end of the transbay trunk requires only the simple opening of its line circuit. By a suitable arrangement this is made to cause the release of the three-wire apparatus. The trunks from Oakland to San Francisco are operated straight two-wire, and hence are simpler than those just described. For the sake of securing sharper, better signals the trunks are wired through the first selector repeaters in the San Francisco main office. Supervision is secured by marginal relays.

APPRAISAL OF THE PUBLIC DOMAIN.

While legislation is under consideration by Congress looking to a more effective conservation policy by the Government than is now possible, Uncle Sam meantime is making the most of his present opportunities and is pushing vigorously ahead in the real work of securing the best development of natural resources. What is known as the "land classification" office-report of the Geological Survey for the month of May contains some live statements.

During the monh the survey reported on 1,097,261 acres of coal land withdrawals of which 329,334 acres were classified as non-coal lands. The coal lands were valued, by 40-acre units, according to the estimated tonnage, and the aggregate price fixed was $58,508,120. Under the minimum price fixed by law, which obtained in the disposal of coal lands until within the past few years, the price of these lands would have been but $13,320,390, a difference of $45,000,000 as a result of one month's work. Heretofore coal land valuations have been based entirely upon the field work of survey geologists but of the above mentioned acreage 14,962 acres of California lands, with a valuation of $585,086, were priced on the basis of a report by a special agent of the General Land Office. This tract of land is the first California land to be classified as coal. New withdrawals of lands, containing more or less coal and subject to future classification and valuation, were made covering 179,561 acres.

Withdrawals Covering Water-Power Sites.

Temporary withdrawals were made covering 27,889 acres along western rivers designed to reserve and protect federal water-power sites, subject to revision after field examination and to further final disposition following legislation by Congress. Restorations were also made covering 25,512 acres of land withdrawn on account of power sites, which was found upon further examination to be non-essential to the Government control of the power. The policy of the survey in making withdrawals and restorations is stated to be that withdrawals of land for all purposes of protection of different resources are made to include as little public land as is deemed necessary to fully protect the Government at the time of the withdrawals, while as fast as subsequent examination of available data or field investigation shows withdrawn areas to be unnecessary to the Government protection such areas are restored to public entry.

OIL AS FUEL ON THE CANAL ZONE.

The first installation of burners for California crude oil was made in the two locomotive type boilers in the Mount Hope pumping station early in 1908. At the present time practically all of the stationary boiler plants along the line of the Canal, the dredges, clapets and other marine equipment on the Pacific end of the Canal, as well as twelve 20-inch by 26-inch mogul locomotives on the Panama railroad main line use oil exclusively. The Sanitary Department also uses this oil for spreading over stagnant water to assist in mosquito extermination.

An article published in The Canal Record of November 11, 1908, gave the terms of the revocable license, granted on January 10, 1906, to the Union Oil Company of California to operate and maintain a pipe line across the Isthmus, and to furnish crude oil to the Isthmian Canal Commission and the Panama Railroad Company at 90 cents per barrel of 42 gallons; and also described the system by which the oil is delivered. On April 1, 1909, an amended contract went into effect providing for a price of $1.10 per barrel (delivered into storage tanks) for a term of six years and guaranteeing the use of not less than 30,000 barrels a month at this price. The oil company has since served notice that if more than 60,000 barrels, the maximum amount named in the contract, are used, a higher price will be charged. About 55,000 barrels are consumed each month at present, the oil being tapped direct from 42 storage tanks situated at convenient places along the line of the canal.

Since the publication of the first article tests have been made by the testing engineer of the Mechanical Division to find out what changes in the various plants using oil would increase the efficiency, and thus lower the cost. The lowest efficiency obtained was that in which 7.12 pounds of water were evaporated from and at 212° F., per pound of oil, and the highest, that in which one pound of oil evaporated 14.22 pounds of water. It has been found in most cases that oil at $1.10 per barrel is more economical than coal at $6.25 per ton, the cost of Pocahontas coal at all points on the Isthmus excepting Cristobal and Colon. The use of oil as fuel has been discontinued at the cold storage plant in Cristobal, because it is cheaper to use coal.

The following table shows the wide variation in economy of the boilers, due to the fact that their settings were designed orginally for coal burning and no very extensive changes were made when they were fitted for oil, because of the former uncertainty of the continued use of this fuel:

The tests were made as nearly as possible under normal working conditions, and the highest economy was obtained at Rio Grande, where all the air for combustion is pre-heated by passing through fire-brick passages below the flame. All the burners are of the steam spraying type, using steam at full boiler pressure and oil under a gravity head of from 30 to 100 feet.

Oil heaters have been installed recently in several of the plants and a gain in economy is expected. The upkeep cost of brickwork has been much higher than when coal was burned, and several new types of furnace, especially designed for oil burning, are under consideration and test at the present time. It is expected that a furnace giving both a high thermal efficiency and a low upkeep cost will be developed within a short time for the 84-inch by 18-foot horizontal fire tube boilers, of which there are thirty in service at Rio Grande, Empire, Las Cascadas, and Gorgona Shops.

FUEL OIL IN THE NAVY.

Secretary of the Navy, George Von L. Meyer, states in a letter to Senator Perkins of California that oil is used as fuel quite extensively on the vessels of the Navy more recently designed. In the case of the latest destroyers oil is the only fuel used, while in the later battle-ships both oil and coal are used under boilers.

This fuel oil is purchased by annual contract, and is advertised for, and bids submitted for in the usual way.

The battle-ships fitted for fuel oil carry about 400 tons each, and the torpedo-boat destroyers about 210 tons each. There are at present built and building, fifteen torpedo-boat destroyers and six battle-ships, using oil as fuel. To fill the oil tanks of these vessels would require about 6150 tons, and, of course, the amount of oil used would depend upon the rapidity with which the tank supply was exhausted.

As to the probable extent of the use of oil as fuel in the future, of course, I am unable to state. At the same time all indications point to its continued use.

Examination for forest engineer is announced by the United States Civil Service Commission on July 27-28, 1910, to fill a vacancy in the position of forest engineer, $1800 per annum, in the Forest Service, and vacancies requiring similar qualifications as they may occur. The examination will consist of pure and applied mathematics, use and construction of instruments, and surveying, design and construction of highways, railroads, dams, retaining walls, foundation work, trusses, etc.

Location		Number and type of boilers.	Rated boiler horsepower generated during test. (Per cent.)	Efficiency of boilers (Per cent.)	Equivalent evaporation from and at 212° F. per lb. of fuel oil. (Lbs. water.)
Cristobal ice plant	6	Abendroth and Root water tube	118.	69.5	12.56
Mount Hope pumping station	2	Locomotive type	65.0	39.0	7.12
Gatun pumping station	3	Locomotive type	198.	61.6	11.23
Gatun power plant	6	Keeler water tube	95.	71.7	13.07
Gorgona pumping station	2	Scotch marine	170.	75.2	13.80
Gorgona shop power plant	6	Horizontal fire tube	79.	70.0	12.49
Las Cascadas air compressor plant	6	Horizontal fire tube	98.	74.1	13.28
Empire air compressor and power plant	12	Horizontal fire tube	101.	76.5	13.69
Rio Grande air compressor plant	6	Horizontal fire tube	90.	77.6	14.22
Ancon pumping station	3	Vertical fire tube	173.	68.5	12.50
Balboa power plant	5	Manning vertical fire tube	71.	63.3	11.75
Balboa power plant	2	Stirling water tube	115.	73.8	12.82

THE RIDGE SUBSTATION AT BERKELEY.

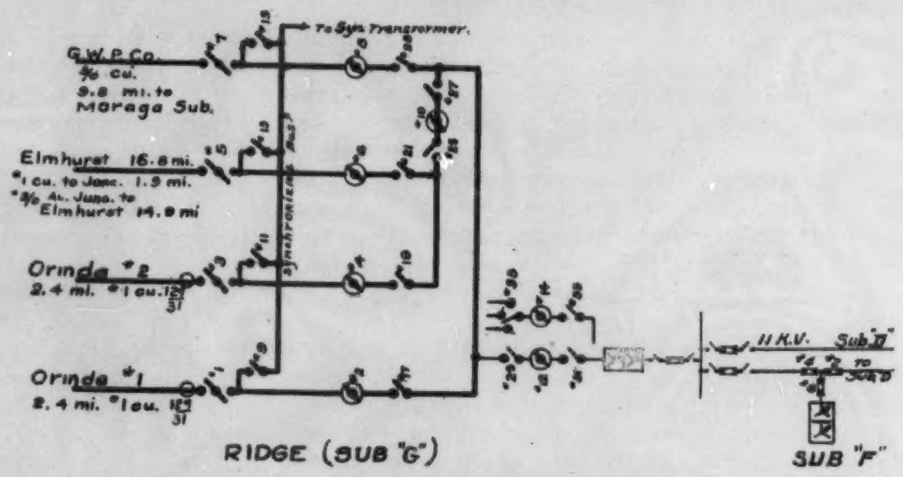
BY C. F. ADAMS

To permit the removal of the Pacific Gas & Electric Company's high-tension wires from the cities of Oakland and Berkeley, the Ridge Substation was constructed. It is east and south of the abandoned quarry of the Spring Construction Company, and is now the terminus of the 60,000-volt lines from South Tower and Elmhurst, and also of one of the branches of the Great Western Power Company. The low-tension feeders (11,000 volts) running from this station supply current to Berkeley and Oakland, and entirely replace the 60,000-volt lines which formerly passed through Berkeley and Oakland.

The station is constructed entirely of concrete, steel, and glass, and is designed to withstand any of the troubles and fire risks which are incident to high-tension switching stations.

Back of the station are located the air-break disconnecting switches, the concrete reservoir and water-cooling tower, and the 60,000-volt potential transformer, used for synchronizing purposes.

Air Switches at the North Berkeley Sub-Station.



High Tension Switching Diagram.

The air-break switches are of the standard, horizontal, double-blade, rotating type, the only new feature being the substitution of an angle-iron frame for the previous all-wood construction. Switch frames also support a line short-circuiting device, and a set of disconnecting switches attached to the synchronizing bus. The entire structure is clearly shown in the general view. Another picture gives a view also of the rear of the station, the 60,000-volt inlet windows, etc. The general arrangement of circuits leading to and from this station is shown on the high-tension switching diagram.

The building itself is divided into two main sections by a fire wall. The east section contains the 60,000-volt oil-switches and wiring. The west section contains the transformers, the 11,000-volt oil-switch compartments, and the switch-board and operating devices for the entire station.

Referring to the high-tension switches, some feature of their mounting are novel. The switch itself is of the horizontal two-break type, the contacts being immersed in a coil held in a wood-fibre container. The switch top is of Catalina marble. Each pole of the switch is mounted in a concrete cell having sheet-iron doors. The height of this cell places the conductors out of reach of the attendant. The cell is designed to resist extreme trouble conditions, and possible ignition of oil.

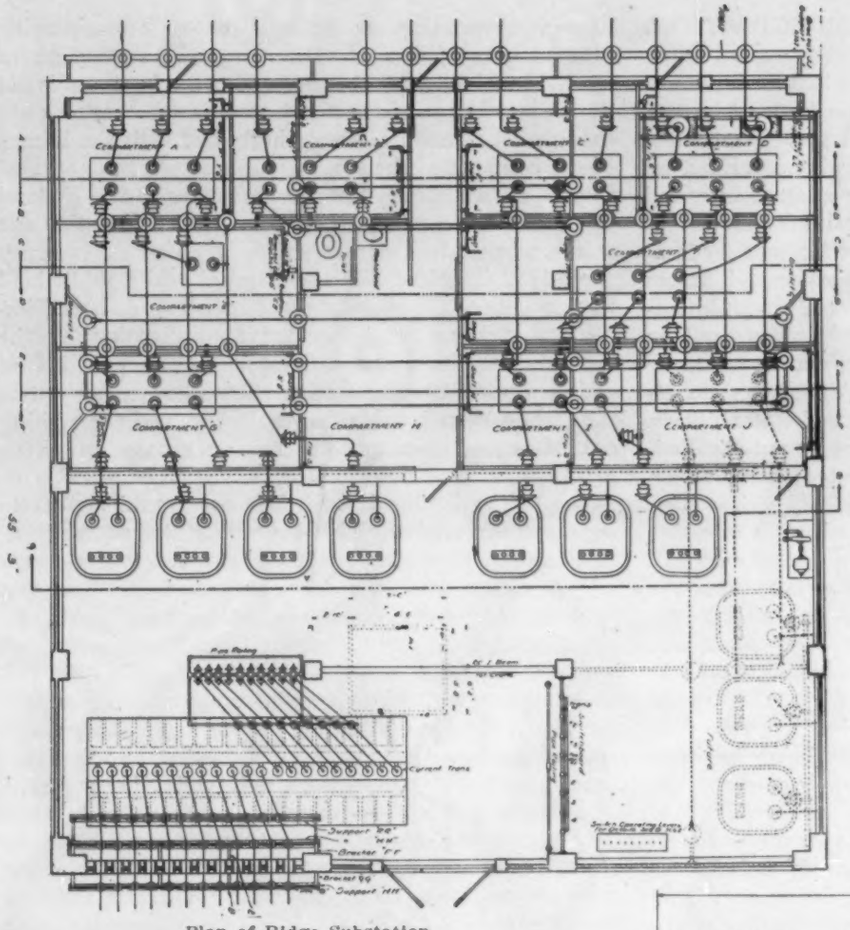
The oil tub rests on a metal shelf and it is removed for inspection by means of a small truck with a screw elevator. Each complete three-pole switch has its own concrete compartment, and the walls of these compartments support the single pole disconnecting switches used on each side of the oil-switches.

In the transformer room are located four 1500-kilowatt transformers, and space has been provided for six more when required.

The transformers are of the water-cooled type, the circulating water being propelled by a small, motor-driven, centrifugal pump. The water drains into a concrete sump, and thence it is elevated into the concrete reservoir and cooling tower. It is fed by gravity through the transformer cooling coils.

The 11,000-volt oil-switches are mounted in a reinforced concrete structure. These switches are the single pole, K-2 type of switch, manufactured by the General Electric Company, and each pole of the switch is enclosed in a separate compartment. The operating mechanism for the three switches is connected to a single operating shaft and released by a single trip.

The operating mechanism, disconnecting switches,

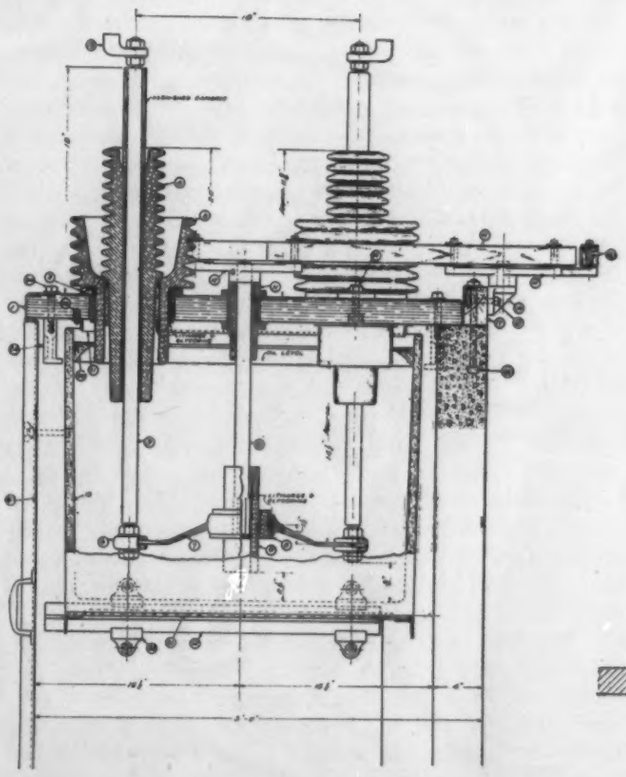


Plan of Ridge Substation.

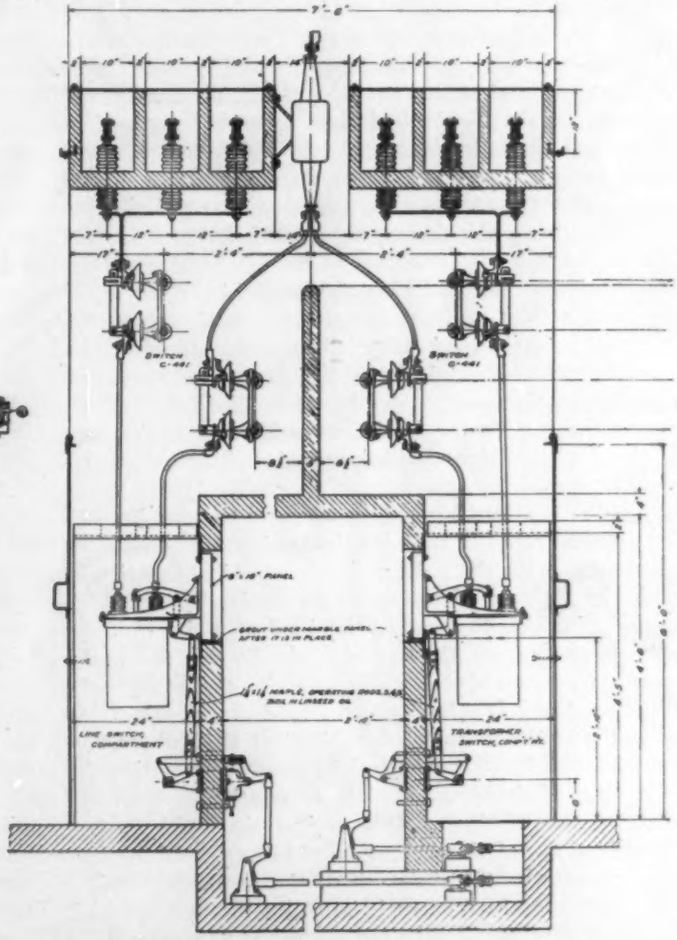
etc., were constructed at the Pacific Gas & Electric Co.'s Sacramento supply district. The switchboard is built of ebony asbestos wood, mounted on a pipe frame, and braced to the concrete walls and columns.

At the present time but two sets of 11,000-volt feeders are carried from this station. These feeders will be increased as the growth of business may require.

An automatic oil switch to take the place of line boxes on overhead 2400-volt distribution lines and to care for predetermined overloads is suggested by A. R. Cheyney in a paper read this week at the annual convention of the American Institute of Electrical Engineers. It would seem that it should be possible to manufacture such a device that would in a measure compete, even in cost, with the present enclosed fuses and line or manhole cut-outs.



The 60,000-Volt Switch.



Cross-Section of the 11,000-Volt Switch Cells.

THE MORALS OF PINCHOT CONSERVATION.

BY RUSSELL L. DUNN.

The temporary withdrawal of blocks of the remaining public land from which some Federal bureau is to select in 40-acre subdivisions for permanent withdrawal the parcels which will then be described as "water-power sites" in the Pinchot patter, is intended in operation to provide the raw material for the establishment of a new economic function for the Federal government. It is proposed that the United States shall lease out and rent these permanently withdrawn-from-disposal parcels of public land to be used as "water-power sites," or, more exactly expressed, to be used as the situs of water-works adapted to, or contributing to, the manufacture and use of water power.

There is a question as to whether or not the Federal government possesses the delegated power to become a landlord in the several States. This, however, is a question of constitutional law and not a question of morals. It is not considered here. For the consideration of the question of morals it is assumed that the United States may become a landlord and rent out the public land instead of disposing of it.

The United States becoming a landlord must perforce adopt a business policy in fixing rental rates for the "water-power sites." Business has morals. The renting of "water-power sites" besides being business as common people understand business, is conservation as uncommon people patter about it. Gifford Pinchot says he is the father of conservation, and, freely adapting from the custom of the Russians which indicates the son of the father by prefixing the name of the father—thus Tzar, the father, and Tzarovitsch, the son of the Tzar—one may indicate this child of its father Pinchot, as Pinchot Conservation, from whence by correlation, as the Geological Survey would express it, the morals of the business of renting the "water-power sites" are the Morals of Pinchot Conservation.

Now there are possible two business policies between which choice may be elected by the United States as its landlord policy in fixing rental rates for "water-power sites." Either the landlord United States may make a flat uniform rental rate based on the area of United States land occupied as the situs of water-works, or, the landlord United States may make special rental rates for each renter based on the profit of his power-earning business without reference to the area of the United States land occupied as situs of water-works.

If the landlord United States were to fix a flat uniform rental rate per acre for the land occupied as situs of water-works, the policy of this would be consistent with the policy of the existing public land laws which provide for the disposal of the land at a flat uniform price per acre for each class of land. By this policy the more acres occupied by water-works the more rent, therefore there is a business reason for a classification of public land now which would select all land for permanent withdrawal which might at any future time by any plan of fabrication of water-works become the situs of any of them. It is a fact that with such a classification definition there would be selected for permanent withdrawal about all of the remaining public land in the Rocky Mountains and Pacific States which "water-power sites" to be rented by the acre means the has any disposal value for settlement. Thus, making permanent stopping of settlement. The question of morals involved with this policy for the business is not with the amount of the fixed acre rental charge, even though it be unconscionably high, but with the breach of the compact of the states. This compact, expressed in acts of admission of sovereign states to the Federal union of sovereign states, expressly providing that the states when admitted with their granted sovereignty should not interfere with the disposal of the public land by the United States, nor tax it pending disposal, implied that there was assumed an obligation by the United Staes to make a disposal of the public land which would cause its settlement. The renting out of the public land is not a disposal of it, and the renting out of it as "water-power sites" prevents its settlement.

But, the landlord United States would appear to have already made an election of the alternative business policy in fixing rental rates for "water-power sites." It is true that the United States has not formally adopted this alternative business policy by act of Congress. But Pinchot Conservation couldn't wait till Congress enacted, and didn't wait. Pinchot Conservation not only elected the alternative business policy for the United States, but by means of ways of official misdirection which it invented to eliminate Congress from the business put the policy in operation. The working condition created was and is the same as if Congress had enacted that the business policy of the United States in fixing rental rates for "water-power sites" would be to fix a special rate of rental for each renter based on the profit of his power manufacturing business without reference to the acreage of United States land occupied as situs of water-works.

By this policy it is very plain that more acres occupied as situs do not mean more rent. Therefore, there is no business reason for a classification of public lands now which will select all land for permanent withdrawal which might at any future time by any plan of fabrication of water-works become the situs of any of them. Practically, the power to fix and collect rent by this policy for "water-power sites" would be secured to the United States with no more United States land than the span's width of it which margins the flow of the waters of the rivers and lakes. Using the public land survey as the basis of selection to obviate the survey of the meanders of the banks of streams and lakes, the power of the United States to fix and collect rent from "water-power sites" would be secured by an act of Congress permanently reserving from disposal or withdrawing from disposal, all 40-acre subdivisions of the public land traversed by or bordering on a water course. There would be no business reason for withdrawals of the public land in blocks for subsequent examination and classification as "water-power sites" as the law could put the burden of proof that the land did not touch water on applicants to enter it.

Making "water-power sites" by permanently withdrawing only the 40-acre subdivisions "touching water," while it would permanently withdraw a large aggregate area of the remaining public land in the Rocky Mountain and Pacific Coast states which has any disposable value for settlement, would not with-

draw all of such land, and it would not stop settlement. The question of morals involved with the business policy under consideration is thus not concerned with this possible withdrawal of the minimum area of public land as "water-power sites." Being possible of accomplishment without the expenditure of public money, consuming nothing but the time and talk of Congress, there is no business in it, and hence no morals in it. But Pinchot Conservation has not elected this line of least economic resistance without morals. Pinchot Conservation has elected to take the chances of the morals and to make "water-power sites" its way by adopting the line of maximum economic resistance, the way which wastes the most public money in examinations and classifications, the way which permanently withdraws from disposal the maximum area of public land, the way which stops most settlement, and the way which breaches to the limit the compact of the Federal union with the several states. Pinchot Conservation thus lives consistent to its conception in a great moral insurgence. It wanted to have all the morals there were. It has all the morals there are.

The business principle at the basis of the policy which would fix a special rate of rental for each renter of a "water-power site" based on the profit of his water-power business is not a new discovery by Pinchot Conservation, although it is so represented by uncommon people who do not know the business of common people except from a looking glass. It is a pity the principle is not new. Really, it is as old as the time when cave men bought and sold stone axes. Pinchot Conservation has undertaken to employ it disguised in a new dress. As presented by Pinchot Conservation this ancient business principle is clothed by providing that an application to rent a "water-power site" from the landlord United States shall be accompanied by plans and specifications for the fabrication of the water-works proposed and also for water-works which would prospectively provide for the manufacture of all the possible quantity of water-power using the same situs of works; that a substantial entry fee shall be paid at the time of application and that a charge shall be made on the capital invested or upon the gross earnings, adjusted every ten years by a new appraisement; that the business shall be limited to earning for the applicant only a reasonable profit on his investment; and that at the end of his lease the landlord United States shall succeed to the business.

Taking the stitches out of the seams of this dress to get at the pattern from which it was cut, it appears that Pinchot Conservation proposes that the landlord United States shall take as rent for its "water-power sites" all of the net earning which the business gains by its margin between the operating cost of manufacturing of its water-power and the current selling price of any form of power in its market, except that portion of the net earning which would be its landlord definition of a "reasonable profit" on the renter's investment in the business. It cannot be assumed that the landlord United States would require of its tenant that it should sell its manufactured commodity, water-power, in one or other form, at less rates than the current selling rate for power in the market, in order that its tenant shall not make more than its definition of a reasonable profit on his investment. Therefore, it must be assumed that Pinchot Conservation proposes that the landlord United States shall keep the profit of the business to the tenant down to its definition of reasonable by taking as rent of "water-power sites" any excess of net earning over reasonable, whatever that is. So with its clothes off and their pattern found, the business principle of Pinchot Conservation is nothing but our old shop-worn familiar, "taking all the traffic will bear."

There is a question of morals involved with applying in these modern times the business principle of "taking all the traffic will bear." The question has been the subject of exceedingly serious discussion because of railroad corporations making application of the same principle in fixing freight rates. The same question of the morals involved has been the subject of even more serious discussion because of large manufacturing corporations, usually referred to inclusively as "the trusts" or "malefactors of great wealth," making application of the principle in fixing the prices of commodities which they sell.

The general conclusion of the discussion is that the morals involved in "taking all the traffic will bear" are scandalous. Our President voicing the public feeling over these morals has anathematized them in messages to Congress. Congress has enacted law with which the Courts may reduce the scandal by forcing the principle into "innocuous desuetude" in the practice of railway freight rate fixing by the railroad corporations and in the pricing for sale of commodities by the "malefactors of great wealth" who make them to be sold.

Yet, right in the midst of the discussion of the scandalous morals of the railroad corporations and the trusts caused by their employment of this business principle—right at the very time when Congress and the President have conducted it and its morals out of railroad corporations by the front door of the Capitol at Washington—Pinchot Conservation has been domiciling the same old business principle of "taking all the traffic will bear" with all its scandalous morals and some more as a permanent resident of the Capitol inducting it in by the back door of the White House. And one may be sure too that neither the President nor Congress have known that Pinchot Conservation was doing this while everybody was looking at it.

WESTINGHOUSE REPORT.

The annual report of the Westinghouse Electric and Manufacturing Company and its subsidiary manufacturing companies for the year ended March 31st, shows a net income of $3,060,644. From the preceding year's operations a deficit of $918,000 resulted so that an increase of $3,979,346 was represented in last year's net. Gross earnings of the company amounted to $29, 248,632, an increase of $8,642,090.

At the close of the fiscal year, March 31, the electric company alone had unfilled orders on its books amounting to $11,256,197. During April and May additional orders were booked aggregating $7,083,033. The total of unfilled orders on hand May 31, 1910, was more than $13,000,000. At but one time in the company's history has the unfilled volume been greater; this was on March 31, 1907, when $14,237,212 of orders were on hand.

THE WATTHOUR METER.

BY WM. M. SHEPARD AND ALLEN G. JONES.

(Continued.)

CHAPTER VIII.

RATES.

The Edison Electric Illuminating Co., of Boston, Mass.

Lighting Rates—Commercial.

Electricity for any use will be sold, under the following schedule, to any customer who has signed an agreement for electric service, embodying the terms and conditions of the company.

A price of 12 cents per kilowatt-hour will be charged for all electricity furnished under this schedule, and the minimum charge will be $1.00 per month per meter.

Power Rates—Commercial.

Electricity for power use will be sold, under the following schedule, to any consumer who has signed an agreement for electric service, embodying the terms and conditions of the company. "Power" is defined as general motor service, cooking, heating, electroplating, charging storage batteries, and similar service, but does not include the running of dynamos for electric lighting purposes.

A price of 12 cents per kilowatt-hour will be charged for all electricity furnished under this schedule, with the following deductions, and the minimum charge will be $1.00 per month per meter:—

A price of 9 cents per kilowatt-hour will be charged for all electricity furnished in excess of 23 and not exceeding 103 hours' use of the *demand for each month.

*The demand is the greatest amount of electricity used by the customer at any one time. Until such time as the company installs one or more indicators, automatically to determine the demand, either in whole or in part, it may estimate the demand. The demand on any circuit, when an indicator is installed, will be the average of the regular monthly readings of the indicator, between October 1st and the following February 1st in each year. The demand so determined, beginning February 1st of each year, shall be the demand for the next twelve months, except that the demand in no case shall be less than 1/3 of the highest reading during the previous twelve months and in no case shall be less than one kilowatt; and provided that if any direct-connected elevator (as defined by the company) be installed the demand shall not be taken at less than 10 kilowatts. The customer has the privilege of having the indicator cut out one night in each month, provided a 48-hour written notice is given to the company.

A price of 6 cents per kilowatt-hour will be charged for all electricity furnished in excess of 103 hours' use of the demand for each month.

Whenever that portion of a customer's bill which is calculated at the 9-cent and 6-cent rate, or both, exceeds $10.00 per month, a discount of 70 per cent will be allowed on such excess over $10.00.

Whenever a customer's bill, after the foregoing deductions have been made, exceeds $100.00 per month, a discount of 30 per cent will be allowed on all in excess of $100.00.

Elevator Rates—Commercial.

Electricity for direct connected elevator use will be sold, under the following schedule, to any customer who has signed an agreement for electric service, embodying the terms and conditions of the company. A "direct-connected" elevator is defined as being an elevator running in guides, and in which the car starts at the same time as the motor.

A price of 12 cents per kilowatt-hour will be charged for all electricity furnished under this schedule, with the following deductions, and the minimum charge will be $1.00 per month per meter:—

A price of 5 cents per kilowatt-hour will be charged for all electricity furnished in excess of 300 kilowatt-hours and not exceeding 600 kilowatt-hours per month.

A price of 3 cents per kilowatt-hour will be charged for all electricity furnished in excess of 600 kilowatt-hours and not exceeding 4000 kilowatt-hours per month.

A price of 2½ cents per kilowatt-hour will be charged for all electricity furnished in excess of 4000 kilowatt-hours per month.

Yearly Lighting Rates—Commercial.

Electricity for any use will be sold, under the following schedule, to any customer who has signed an agreement for yearly electric service, embodying the terms and conditions of the company.

A price of $60.00 per year, payable in equal monthly installments will be charged per kilowatt of the *demand up to and including 15 kilowatts.

*The demand is the greatest amount of electricity used by the customer at any one time. Until such time as the company installs one or more indicators, automatically to determine the demand, either in whole or in part, it may estimate the demand, but in no case shall it be taken at less than 2/10 of a kilowatt. The demand on any circuit, when an indicator is installed, will be the greatest reading of the indicator between November 1st and the following February 1st of each year, and the demand so determined, beginning February 1st of each year, shall be the demand called for by the agreemnt for the next twelve months, except that the demand in no case shall be less than 1/3 of the highest reading during the previous twelve months. The customer has the privilege of having the indicator cut out one night in each month, provided a 48-hour written notice is given to the company.

A price of $36.00 per year, payable in equal monthly installments, will be charged per kilowatt of the demand for all kilowatts exceeding 15 and up to and including 55.

A price of $30.00 per year, payable in equal monthly installments, will be charged per kilowatt of the demand for all kilowatts exceeding 55.

These prices do not include the supply of electricity.

A price of 5 cents per kilowatt hour will be charged for all electricity furnished under this agreement up to and including 1500 kilowatt-hours per month.

A price of 3 cents per kilowatt-hour will be charged for all electricity furnished under this agreement exceeding 1500 kilowatt-hours and up to and including 5500 kilowatt-hours per month.

A price of 2½ cents per kilowatt-hour will be charged for all electricity furnished under this agreement exceeding 5500 kilowatt-hours per month.

Permanent Electric Rates.

Electricity for any use in specified premises will be sold, under the following schedule, to any customer who has signed an agreement for at least 50 kilowatts of permanent electric service, embodying the terms and conditions of the company.

A price of $60.00 per year, payable in equal monthly installments, will be charged per kilowatt of service up to and including 15 kilowatts.

A price of $36.00 per year, payable in equal monthly installments, will be charged per kilowatt of service for all kilowatts exceeding 15 and up to and including 55.

A price of $30.00 per year, payable in equal monthly installments, will be charged per kilowatt of service for all kilowatts exceeding 55.

These prices do not include the supply of electricity.

A price of 5 cents per kilowatt-hour will be charged for all electricity furnished under this agreement up to and including 1500 kilowatt-hours per month.

A price of 3 cents per kilowatt-hour will be charged for all electricity furnished under this agreement exceeding 1500 kilowatt-hours and up to and including 5500 kilowatt-hours per month.

A price of 1½ cents per kilowatt-hour will be charged for all electricity furnished under this agreement exceeding 5500 kilowatt-hours and up to and including 105,500 kilowatt-hours per month.

A price of 1¼ cents per kilowatt-hour will be charged for all electricity furnished under this agreement exceeding 105,500 kilowatt-hours per month.

The company will deliver its electricity at the customer's premises, and, in consideration of not supplying lamps and

care, will deduct from the net amount of the bill, as otherwise rendered, ½ cent per kilowatt-hour.

The company will provide capacity for intermittent overloads up to 40 per cent in excess of the kilowatts applied for by the customer.

An excess price of 20 cents per kilowatt hour will be charged for all electricity furnished at any time in excess of the kilowatts applied for by the customer.

Terms and Conditions.

For the purpose of determining the amount of electricity used, a meter shall be installed by the company upon the customer's premises at a point most convenient for the company's service, upon the reading of which meter all bills shall be calculated. If more than one meter is installed, unless for the company's convenience, each meter shall be considered by itself in calculating the amount of the bill. When more than one meter or discount indicator is installed under this agreement, for the company's convenience, the sums of the consumptions and demands shall, in all cases, be taken as the total consumption and demand.

All bills shall be due and payable upon presentation and shall be rendered monthly, unless either the customer or the company desires bills rendered weekly, in which case it may be done by adjusting to a weekly basis all the monthly figures referred to in the schedule of rates.

A minimum charge will be made of $1.00 per month per meter, unless otherwise provided.

The customer will be responsible for all charges for electricity furnished under this agreement until the end of the term thereof and for such further time as he may continue to take the service; except that where the customer has the right to terminate the agreement by notice, which shall be in writing, he shall remain liable for all charges for ten days thereafter.

The customer will be responsible for all damage to, or loss of, the company's property located upon his premises unless occasioned by the company's negligence.

The corapany shall not be responsible for any failure to supply electricity, or for interruption or reversal of the supply, if such failure, interruption or reversal is without default or neglect on its part.

The company reserves the right to install a circuit breaker, so arranged as to disconnect the service in the premises, if the company's capacity at that point is exceeded.

If a customer, who is not paying a rate calling for an annual fixed cost, desires to use the electric service as auxiliary to another source of power (excluding, however, small sources of power not exceeding two horsepower) he may do so only by paying a minimum charge of $3.00 per month per kilowatt for as many kilowatts as it is possible for him to use on the service at any one time; this number to be determined by a circuit breaker, so arranged as to disconnect the service if the number of kilowatts is exceeded.

It is agreed that all lamps, plugs, meters and such other appliances as are furnished by the company shall remain its property. And it is further agreed that all wiring upon the premises of the customer, to which the company's service is to be connected, shall be so installed that the company may carry out this contract, and shall be kept in proper condition by the customer.

Permission is given the Company to enter the customer's premises, at all times, for the purpose of inspecting and keeping in repair or removing any or all of its apparatus used in connection with the supply of electricity, and for said purpose the customer hereby authorizes and requests his landlord, if any, to permit said company to enter said premises.

The benefits and obligations of this contract shall inure to and be binding upon the successors and assigns, survivors and executors or administrators (as the case may be) of the original parties hereto, respectively, for the full term of this contract.

(To be continued.)

Delegates at Railway Telegraph Association Meeting.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.

The twenty-ninth annual convention of the Association of Railway Telegraph Superintendents was held in Los Angeles from June 20th to 26th. The visitors were welcomed to Los Angeles by the Hon. George Alexander, Mayor, and Mr. Joseph Scott, president of the Chamber of Commerce. Mr. Scott's invitatoin to partake of the fruits of Southern California was substantiated by each visitor finding a large basket of luscious Californian fruits awaiting him in his apartments.

The various papers presented before the meeting were on pertinent subjects, some of which will subseqcently be reproduced in these columns. One of the most interesting meetings was that of Thursday evening, when the local members of the American Institute of Electrical Engineers attended. The subject, "High Tension Crossings,' was one of considerable interest and the discussion was ably led by Messrs. Miller, Scattergood, and other members. The use of telephones for train dispatching was thoroughly presented by many members.

It was a fitting tribute that the greatly appreciated services of Mr. I. T. Dyer were rewarded by electing him to the presidency of the association for the ensuing year. The other officers elected were: J. B. Sheldon, Union Pacific, Omaha, first vice-president; William Bennett, Chicago and Northwestern, Chicago, second vice-president; P. W. Drew, Minneapolis, St. Paul and Sault Ste. Marie, re-elected secretary-treasurer.

JOURNAL OF ELECTRICITY
POWER AND GAS

PUBLISHED WEEKLY BY THE
Technical Publishing Company

E. B. STRONG, President
A. H. HALLORAN, Vice President and Managing Editor
C. L. CORY, Secretary.

DIRECTORS
R. J. DAVIS A. M. HUNT A. H. HALLORAN C. L. CORY E. B. STRONG

604 MISSION STREET, SAN FRANCISCO

EASTERN OFFICE, 150 NASSAU STREET, NEW YORK
C. N. MANFRED, Eastern Manager
LOS ANGELES OFFICE, 107 SECURITY BUILDING

TERMS OF SUBSCRIPTION

United States, Cuba and Mexico	per year,	$2.50
Dominion of Canada	"	3.50
Other Foreign Countries within the Postal Union	"	5.00
Single Copies, Current Month	each	.10
Single Copies, prior to Current Month	"	.25

NOTICE TO ADVERTISERS

Changes of advertising copy should reach this office *ten days in advance of date of issue.* New advertisements will be accepted up to noon of Monday dated Saturday of the same week. Where proof is to be returned for approval, Eastern advertisers should mail copy at least thirty days in advance of date of issue.

Entered as second-class matter at the San Francisco Post Office as "The Electrical Journal," July 1895.
Entry changed to "The Journal of Electricity," September, 1895.
Entry changed to "The Journal of Electricity, Power and Gas," August 15, 1899.
Entry changed May 1, 1906, to "The Journal of Electricity, Power and Gas," Weekly.

FOUNDED 1887 AS THE
PACIFIC LUMBERMAN, CONTRACTOR AND ELECTRICIAN

CONTENTS

Telephone Engineering Around the Golden Gate 1
By A. B. Smith.
Appraisal of the Public Domain 6
Fuel Oil in the Canal Zone 7
Fuel Oil in the Navy 7
Examination for Forest Engineer 7
The Ridge Sub-Station at Berkeley 8
By C. F. Adams.
An Automatic Oil Switch 9
The Morals of Pinchot Conservation 10
By Russel L. Dunn.
Westinghouse Report 11
The Watthour Meter 12
By Wm. M. Shepard and Allen G. Jones.
Rates of Edison Electric Illuminating Co.
Association of Railway Telegraph Superintendents 13
Editorial 14
Killing the Goose.
Personals 15
Trade Notes 15
Patents 16
Electric Water Heater.
Electrical Piano.
Oil Burner.
Universal Photometer.
Apparatus for Electrical Treatment of Ores.
Industrial 17
Electrical Switching Locomotive.
New Catalogues.
Drum Type Controllers for Machine Tools.
Train Dispatching Equipment.
News Notes 19

Killing the Goose

A nicety which forbids bull fighting and ostracises prize fighting permits the popular pastime of baiting public service corporations. Like a practical joke, it hurts not only those attacked but also reacts on the perpetrators, for all community prosperity is closely interwoven with those enterprises whose magnitude and risk require capital for their inception and development. Public ownership and operation of public utilities is theoretically ideal. When a municipality has the initiative to install an electric plant and the political purity to run it economically the citizens are the gainers in receiving such service at the cost price. But it usually requires some farsighted business man with the courage of his convictions to risk the money necessary to make these public improvements. It also requires careful management to make the venture a dividend payer, a care which is not necessary in a municipal plant which can collect taxes to pay deficits or depends on municipal bonds for extensions. We hold no brief for the private corporation, but regard this matter merely in the light of the self-interest and self-preservation of the community's prosperity.

What is it that gives value to outlying real estate if it is not rapid transportation, convenient telephone service and proper lighting? Quick transit allows us to enjoy the comforts of a suburban home; the telephone enables us to do twice the business in half the time, the electric light is a better protector than policeman and doubles the hours for business or pleasure. Withdraw them and the property is good only for a cow pasture. Yet, if the present campaign of vilification and persecution be not stopped the corporations will be obliged to surrender their holdings to the tender mercies of the petty grafters who seek easy berths in municipal plants. There are too many tempting investment propositions for capital to long linger where it is not appreciated.

Even when not driven to the extreme of abandonment a corporation thus treated has but little incentive to improve or extend its service. On the other hand an approving public sentiment fosters developments such as have heretofore been made in Spokane and Los Angeles whose street railway systems are the admiration of the world as contrasted with the dilapidated outfit that is a direct result of the late San Francisco administration's custom of hampering legitimate development. The inevitable result of such destructive agitation will first be felt in the Eastern bond markets where investors will fear to trust their savings to the caprice of local rate regulators or to the violence of striking carmen. By undermining the confidence upon which we are dependent for the needed capital to develop the West, these self same agitators are insidiously attacking the country in which they live and as such are not desirable citizens.

PERSONALS.

G. I. Kinney, Pacific Coast manager for the Sprague Electric Company, is spending a week at the Los Angeles office.

J. P. Downs, the Pacific Telephone & Telegraph Company's general superintendent of traffic, is in Honolulu on a vacation trip.

Leon M. Hall, consulting engineer for the Comstock mines, has gone to Virginia City, and expects to celebrate the Fourth of July in Reno.

G. B. Bush, general commercial superintendent of the Pacific Telephone & Telegraph Company, is in the Pacific Northwest on an inspection tour.

Sidney Sprout, electrical engineer, is making a week's tour of Southern California, visiting Los Angeles and the Burrell power station in the Kern river canyon.

C. O. G. Miller, president of the Pacific Lighting Corporation, has gone to Santa Barbara and will spend a month in Southern California, automobiling with his family.

Leon Vanatta, a recent Stanford graduate who has been with the Northwestern Pacific railroad, is now with the Pacific Electric & Manufacturing Company of San Francisco.

Paul Shoup, assistant general manager of the Southern Pacific Company, in charge of all the electric railway lines, has returned to San Francisco from a trip to Los Angeles.

H. A. Culloden, who had been acting auditor of the Pacific Electric Railway Company, has been elected secretary and auditor of that company with headquarters at Los Angeles.

Charles F. Mason, commercial engineer of the Pacific Telephone & Telegraph Company, attended the recent convention of railway telegraph superintendents at Los Angeles.

H. D. Donnell, assitant engineer of the Safety Car Heating and Lighting Company has taken office room with Sidney Sprout and A. C. Sprout at 922 Crocker Building, San Francisco.

H. B. Woodill of Los Angeles has been elected president of the Long Beach Electrical Manufacturing Company. J. N. Nighton will soon take charge of the sales department of the same company.

The newly elected executive committee, Los Angeles Section, A. I. E. E., for year 1910-1911, is E. K. Davis, I. T. Dyer, J. A. Lighthipe, J. E. Macdonald, R. H. Manahan, E. K. Northmore, E. F. Scattergood.

M. M. O'Shaughnessy has returned from San Diego, after inspecting the operations at the Morena dam, which he is constructing in the mountains for the Southern California Mountain Water Company of San Diego.

C. S. Sedgewick, who was connected with the commercial department of the Pacific Gas & Electric Company during the past year, recently went to Dixon, Cal., as manager of the Solano District, which now extends down the peninsula from Davisville.

G. R. Field, assistant general manager of the Great Western Power Company, has returned from a trip to the hydroelectric plant at Big Bend, where the construction of the big dam is progressing satisfactorily. The water in the river has reached a stage low enough to permit of more rapid work.

S. G. McMeen and H. A. Lardner have been elected to fill two-year terms on the executive committee of the San Francisco Section, A. I. E. E. and W. A. Hillebrand, a one-year term, the remaining members being C. W. Burkett and S. J. Lisberger. Mr. Hillebrand is the delegate to the national convention.

W. A. Widenmann has been made manager of the Stanislaus District which was recently created by the Pacific Gas & Electric Company, with headquarters at Newman. The electric distributing system of the Newman Light & Power Company was recently purchased by the company and an extension of fourteen miles from the Patterson ranch will give connection with the main transmission lines.

H. F. Jackson, assistant general manager of the Sierra & San Francisco Power Company; H. W. Crozier of Sanderson & Porter, and George J. Henry Jr. and W. D. Ward of the Pelton Water Wheel Company recently inspected the Sierra & San Francisco Power Company's hydroelectric plant whose four generators are being reconstructed so as to increase their normal rating to 8700 kw. each. A parallel transmission tower line is also being built, to be completed in September, at a cost of $500,000.

TRADE NOTES.

N. M. Goldthwaite is now San Francisco agent for the U. S. Electrical Manufacturing Company of Los Angeles.

The General Electric Company has sold to the Alaska-Treadwell Gold Mining Company a 250-h.p., 2200-volt, 720-r.p.m. motor for use at the mines.

The Oakland Traction Company has purchased ten General Electric 2.16 (50 h.p.) two-motor car equipments for use on the street railway lines in Oakland.

The Smith-Booth-Usher Company of Los Angeles have installed a 10x10 triplex Gould single-acting pump with a 20-h.p. electric motor at Whittier City water plant and are pumping at present 300 gallons a minute.

Henry C. Hyde recently succeeded W. A. Ekberg as representative of the Peerless Electric Company, Willard Storage Battery Company, Hart Manufacturing Company, Hartford Time Switch Company, Frank Adam Electric Company, Condit Electric Manufacturing Company, and Enamelled Metals Company at 143 Second Street, San Francisco.

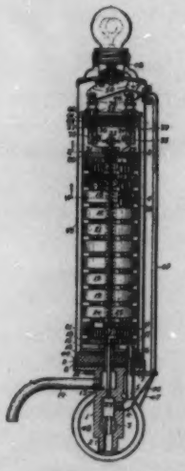
The Charles L. Kiewert Company of San Francisco have arranged with the Union Eng. Co., 225 Franklin Court, Los Angeles, to act as their agents in the southern territory for the Kiewert Lighting Specialties, including Aurola and Alba flaming arcs and Siemens carbons for enclosed arcs, flaming arcs and moving pictures. They are preparing to establish agencies in all important cities on the coast.

Recent orders and shipments of the Pacific Electric & Manufacturing Company of San Francisco include six thirty thousand volt switches to Dawson, Y. T., three sixty thousand volt switches to the Pacific Coast Power Company, Seattle, Wash.; 24 twenty-two thousand oil disconnecting switches to the Sacramento sub-station of the Great Western Power Company, six high voltage switches to Deadwood, S. D., and two new type suspension insulator switches for the one hundred thousand volt line of the San Francisco & Sierra Power Company at Mission San Jose.

F. G. Sykes, president of the American Power & Light Company of New York, announced in Spokane that negotiations have been completed for the purchase of electric, gas, water and street railway plants in eleven cities in southeastern Washington and northern Oregon and Idaho. Properties will be operated by the Pacific Power & Light Company, capitalized for $7,500,000 and incorporated by the first named concern at Pasco, Kennewick, Sunnyside, Mabton, Wapato, North Yakima, Walla Walla, Lewiston, Pendleton, Adams, Freewater, and Astoria, Ore. The company will also own and operate steam-generating plants at Astoria, Walla Walla and Kennewick, a water-power plant on the Walla Walla river and combined steam and water-power plants at North Yakima and on the Natchez river, ten miles above North Yakima. Mr. Sykes said the chief purpose in getting into the Inland Empire is to furnish power for irrigation plants in the Columbia river, Yakima and Walla Walla valleys.

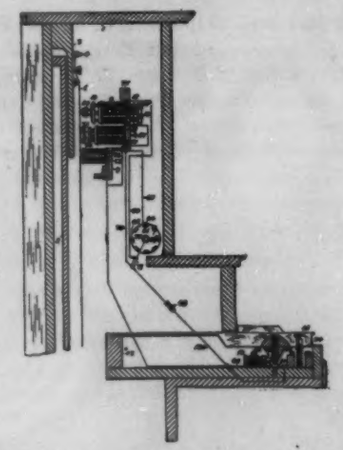
PATENTS

961,937. Electric Water-Heater. William F. Cutler, San Francisco, Cal., assignor to Cutler National Electric Heater Company, San Francisco, Cal. The combination of a heating chamber, a vertical series of inverted cup-shaped insulators therein, each apertured to permit the liquid to freely circulate therethrough; coils in said insulators, electric conductors



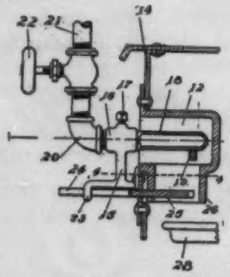
leading to said coils, a discharge pipe for conducting the liquid from said heating chamber, means for admitting the liquid at the opposite end of the heating chamber to that from which said discharge pipe conducts, and an auxiliary supply pipe discharging into said heating chamber at the same end as that from which the discharge pipe conducts.

962,261. Electrical Piano. Robert A. Rose and George C. Holbrook, Santa Rosa, Cal. The combination, with strings, of hammers having parts attached thereto, solenoids arranged at right angles to said strings and immediately behind the hammers, frames carrying said solenoids, and provided with



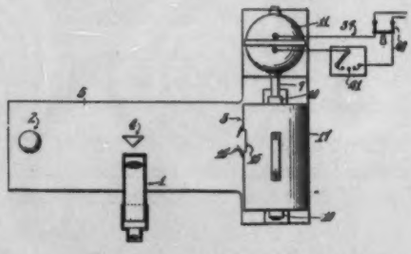
means for guiding the hammers to and from the strings and in a direction at right angles thereto, cores in said solenoids detached from the hammers, said solenoids being arranged to attract said cores to cause them to impinge upon said parts attached to the hammers, and propel the hammers against the strings, and springs for withdrawing the cores.

962,212. Oil-Burner. Henry R. Green, Spokane, Wash. A burner comprising a casting having an air chamber therein in communication with the atmosphere, an air discharge tube leading from said chamber at right angles to the communication with the atmosphere, a receptacle disposed beneath said air discharge tube, a bracket fixed to said casting, an oil feed nozzle extending within said air chamber and having a dis-



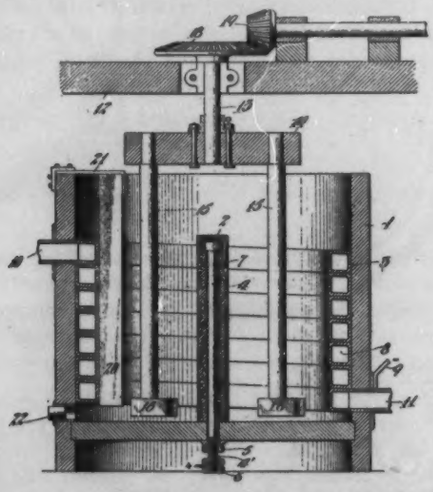
charge tube in alinement with the air discharge tube, a guide eye formed on said bracket, and a cut-off slide working in said eye and adapted to open and close said air discharge tube.

961,852. Universal Photometer. Tamaki Fujita, Los Angeles, Cal. In a photometric apparatus, means for producing rays of light of different color, intercepting means for cutting



off a variable portion of the light of each color, and means for directing said rays onto a comparator to blend the effects of the differently colored rays of light for production of the effect of a composite light for the purpose stated.

962,040. Apparatus for Electrical Treatment of Ores. William B. McPherson, Los Angeles, Cal., assignor of one-half to Gail Borden, Los Angeles, Cal. An apparatus for electrical

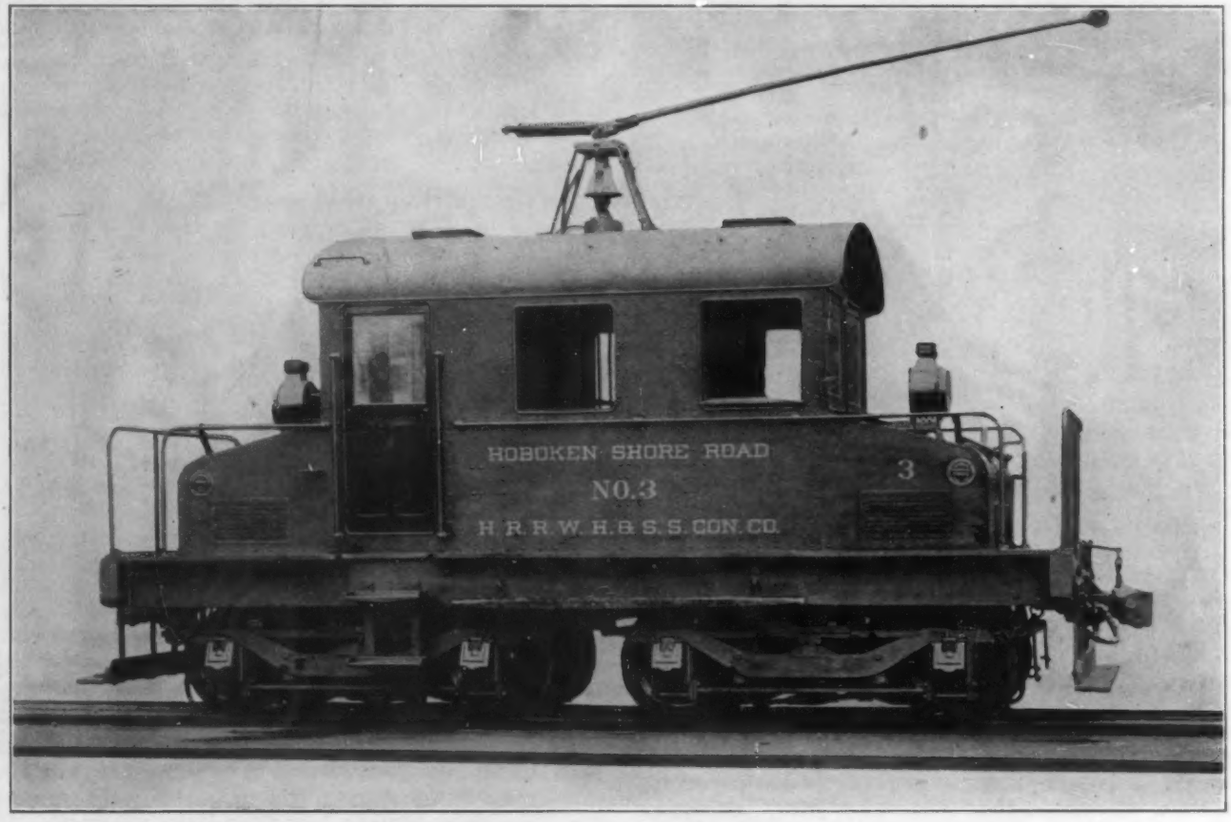


treatment of ores comprising a central electrode therein, an outer electrode concentric with the central electrode, said outer electrode being hollow and provided with means for passing heating medium therethrough.

INDUSTRIAL

ELECTRIC SWITCHING LOCOMOTIVE EXCITES FAVORABLE COMMENT.

The Hoboken Railroad, Warehouse & Steamship Company has had in operation since May, 1906, a sixty-ton electric switching locomotive whose remarkably continuous and economical performance under varying and severe load conditions has caused many very favorable comments in railroad circles. This locomotive has not only supplied the demand made most urgently by operating men that the service be perfectly reliable, but has been operated continuously at a maintenance cost that is exceedingly low.



A Sixty-ton Electric Switching Locomotive.

Since the electric locomotive was placed in operation four years ago there has not been replaced a single contact on the switch group or a contact on the master switches or reverser. On the control apparatus nothing other than two tips on the live switch has been replaced. The brushes that are in the motors at the present time have been operating fourteen months, and the master mechanic believes they will operate at least six months longer without replacement. No trouble has been experienced with broken brushes. Except that there has been replaced one pinion which was broken when a lock washer dropped into the gears, no repairs on the motor have been necessary.

The cost of inspection and cleaning has been practically nothing. Every Saturday morning the man operating the locomotive makes an inspection of the equipment. With compressed air he blows out the motor and the various parts of the control apparatus, and cleans any part that may need it with a piece of cloth. This work is not charged to maintenance, as the operator in doing it is simply filling in his time. No extra time is needed for maintenance or inspection.

The locomotive has a running and a starting drawbar pull of 14,500 pounds and 30,000 lbs., respectively, and has a normal speed of 12 miles an hour. It has four 100 h.p. slow speed motors; a hand operated unit switch control, and Westinghouse air brakes with a D-4 compressor. The electrical equipment was furnished by the Westinghouse Electric & Manufacturing Company, Pittsburg, Pa.; the mechanical parts, the steel cab and the trucks were built by the Baldwin Locomotive Works. The Hoboken Company stated that there never has been a time when the locomotive refused to work or would not do the work required of it. It averages twelve hours a day of shunting service very nicely every day in the year.

NEW CATALOGUES.

Bulletin No. 1070 from the Allis-Chalmers Company is devoted to "Barometric Condensers, Type B."

Ohio Valves and Steam Specialties are attractively listed in Catalogue H from The Ohio Brass Company of Mansfield, Ohio.

Bulletin No. 11 from the engineering department of the National Electric Lamp Association covers the description, performance and economy of the "Mazda" street series lamp.

"Type C Jet Condensers" are illustrated and described in Bulletin No. 1071 from the Allis-Chalmers Company. With this type vacuum can be formed or recovered with full load on engine or turbine, without stop valve in main exhaust pipe or auxiliary forced injection.

DRUM TYPE CONTROLLERS FOR MACHINE TOOLS.

For the control of machine tools driven by electric motors where the starting service is frequent or of a severe nature, drum type controllers should be used in preference to other types. The General Electric machine tool controllers shown in their book of information on industrial control devices, have been designed with many special features to meet the conditions of modern shop practice. Among these features may be mentioned substantial removable barriers between the fingers wherever required; magnetic blow-outs for all equipments for 500-volt service or for large currents at lower voltages; special screws to hold the segments with heads slightly countersunk below the surface so as to prevent their wearing with the segments, and tapered at such an angle as to prevent their loosening; sheet iron covers lined with asbestos to protect live parts from dust and mechanical injury, and eliminate danger of shock from accidental contact; terminals and other parts readily accessible; and field control with adjustable fingers similar in design to the fingers for the armature circuit.

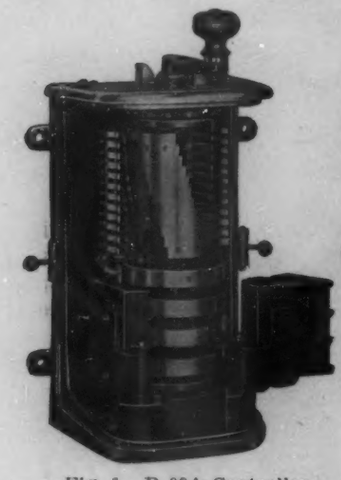


Fig. 1. R-99A Controller.

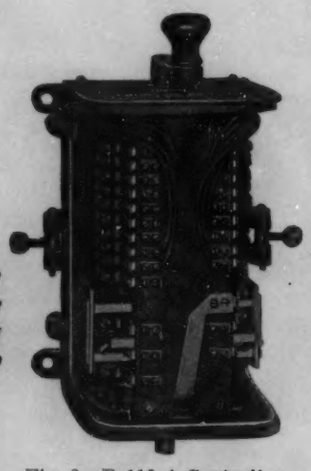


Fig. 2. R-116-A Controller.

When it is desired to obtain overload and no voltage protection in connection with drum controllers, a CR-251 panel should be used. This panel consists of a DP circuit breaker, a single pole contactor and two fuses, all mounted on a slate base, the latter being provided with feet to make a neat installation. The circuit breaker and fuses afford the overload, and the contactor the no voltage protection. The operation of these panels depends essentially upon an electrical interlock between the no voltage release and the drum controller. When the controller handle is moved to the first point the coil of the contactor is energized, closing the contactor and completing the armature circuit. As greater force is required to close the contactor than to hold it closed, when the controller handle is moved beyond the first point, a high resistance is inserted in series with the contactor coil to prevent the contactor from closing in case of a restoration of voltage after failure, until the controller is turned back to the first point. This device is designed for both shunt and compound wound motors.

In Bulletin No. 4744, issued by the General Electric Company, is described a meter testing rheostat, which by means of switches forming a part of the device, may be made to give loads varying from one-half an ampere to the full load rating of the rheostat in one-half ampere steps. The rheostat is made in two sizes: one of 15 ampere and the other of 30 ampere capacity, weighing 7 and 14 pounds, respectively.

TRAIN DISPATCHING EQUIPMENT.

The extensive exhibit of telephone train dispatching apparatus by the Kellogg Switchboard & Supply Company at the Los Angeles convention of Railway Superintendents of Telegraph, June 20-26th, demonstrated to what limit this feature has been developed. To those who are more or less interested in telephony this display was indeed a surprise, and even to those who have been personally concerned in this branch of communication the perfection and completeness of Kellogg apparatus was distinctly noticeable.

The exhibit room was the point of interest for all delegates and visitors from the opening time until the close, and in addition to much valuable information gained by the visitors the Kellogg company had the satisfaction of securing several substantial orders for apparatus after the various makes had been compared.

The Wray-Cummings and the Gill selectors were both exhibited, as either type is supplied, this being a point to be settled entirely by the user. One of the most interesting

KELLOGG SWITCHBOARD & SUPPLY CO.
SAN FRANCISCO—CHICAGO—KANSAS CITY—
HIGHEST GRADE TELEPHONE APPARATUS
"THE TRANSMITTER THAT NEVER PACKS"

Kellogg Exhibit at Meeting of Railway Telegraph Superintendents.

items was a section of a Kellogg transmitter, the vital point of all telephone equipment. The non-packing and non-deteriorating qualities of this transmitter were clearly shown and many personal testimonials were received from actual users all the way from Mexico to Canada. The new steel mouth piece with a perfect insulation to protect the telephone user from foreign currents drew many favorable remarks.

Various types of portable telephones for train use were displayed. The large type containing hand generator, ringer, and micro-telephone set, all encased in a heavy steel case, to prevent breakage by careless train crews, was especially noted on account of its indestructibility, and the micro-telephone set with small battery equipment, all mounted in a leather carrying case was commented upon for its compactness and lightness.

The waiting-room set, high-tension insulated set, and non-breakable portable desk set were exclusive features, and the head band receiver with a swivel joint in the band to admit of its use as a hand telephone attracted more than usual attention. The jointed pole for connecting trains to the dispatcher's circuit was also shown. Composite telephones, for operation on the same circuit with telegraph instruments, were in actual operation.

The entire exhibit was made up from the stock room of the Kellogg Company in San Francisco, showing the completeness of this stock, and demonstrating the advisability of all coast companies using a type of equipment which they can secure at short notice.

NEWS NOTES

INCORPORATIONS.

YUMA, ARIZ.—The Yuma Gas Company has been incorporated by W. Jay Fair, C. J. Lynch and others with a capital stock of $1,000,000.

GARFIELD, WASH.—The Garfield Town and Rural Telephone Company has been incorporated by W. B. Harris, J. A. Dix, F. M. Scott and others.

OLYMPIA, WASH.—The consolidated Printing Telephone Company has been incorporated by G. Mackay, C. E. Collier, B. A. Barr, T. B. Rae, J. H. Kugler, G. T. Parker and J. B. Bancus, with a capital stock of $25,000.

TRANSMISSION.

LEWISTON, IDAHO.—The Lewiston-Clarkston Improvement Company has started preliminary work for its proposed power plant on the Grand Ronde river.

CENTRALIA, WASH.—The Twin City Light & Traction Company has let the contract for a $150,000 power plant to be located on Coal creek about four miles southeast of here.

BELEN, NEW MEX.—A petition has been presented by M. W. Flournoy of Albuquerque, asking the Board of Commissioners to grant him a franchise for electric power plants at Belen.

REDDING, CAL.—The Inskip power plant of the Northern California Power Company has started up, adding 8000 h.p. to the electrical output of the company and making its total 27,000 h. p., itemized as follows: Volta power house, 9000; Kilarc, 4000; South power house, 6000; Inskip, 8000. Inskip is on South Battle Creek, in Tehama county, one mile from the Shasta line.

SEATTLE, WASH.—Plans have been announced by the Vancouver Power Company, a subsidiary organization of the British Columbia Electric Railway Company, which contemplates the development of 100,000 horsepower of electric energy. The source of power is located in Chilliwack lake and Jones lake, both lying in the Chilliwack district. To fully develop the two sources of power the British Columbia Electric Railway Company will expend $10,000,000.

LEWISTON, IDAHO.—The Lewiston-Clarkston Improvement Company has sent a party of engineers to the Grand Ronde to commence the surveys preparatory to the installation of a power station. The company has acquired title to the power site and all necessary holdings and has made extensive engineering investigations relative to the character of the formation, the power ditch and matters pertaining to the construction work. The construction of the Grand Ronde power plant is one of the first matters to receive the attention of the new interests, as the present power plants are inadequate to supply the demand for power, and the water used in the operation of the Asotin Creek plant is needed for the Clarkston Heights irrigation district.

SAN ANDREAS, CAL.—The Sierra Nevada Water Company, which for a number of years was endeavoring to develop a part of the water-power of the Mokelumne river at a point between Railroad Flat and West Point, and actually commenced operations on a large scale, will shortly resume under a new organization. Aside from purchasing ditches and established water rights, the company, through its men in the field, located everything which it believed might prove of future value. A large basin suitable for reservoir purposes was purchased and construction work on a dam below the Licking fork commenced. Thousands of dollars were expended when the financial stringency following the fire struck the company hard and it was unable to meet its obligations. It also became involved in considerable litigation. Frank Z. Towle had been general manager for the company, also being interested financially. With the other creditors he failed to get any money for his services, and finally all claims were assigned to Milton Bernard, who obtained a judgment for $12,202.77. A transfer was made to the company, and Towle, who had also further protected himself by relocating lapsed water rights, included these, all for the purpose of clearing title and settling the financial end through an amicable understanding. The situation at the present time is such that the company intends to immediately resume operations and complete its power plant.

TRANSPORTATION.

LOS CRUCES, NEW MEX.—The City Council has passed an ordinance granting to Isidoro Armigo and S. T. Reynolds, a franchise to construct an electric street railway in this city.

MARTINEZ, CAL.—A. W. Maltby, vice-president of the Antioch and Oakland Electric Railroad has applied for a franchise to operate trains on the county roads between Martinez and Pacheco.

SEBASTOPOL, CAL.—The matter of granting a franchise to John E. Bennett for an electric line from the power house in Sebastopol to the town limits was taken up, and an ordinance passed granting the franchise.

RIVERSIDE, CAL.—The Council has instructed the City Attorney to draw up an ordinance relinquishing the Crescent Railway Company's franchise from all unused portions of the road over which the franchise extended.

SAN FRANCISCO, CAL.—Announcement is made by the United Railroads of a change in the operation of the Haight street owl line. The new schedule calls for a half-hourly service on the Haight street owl line, instead of hourly, as heretofore.

SAN BERNARDINO, CAL.—It has been announced that the Santa Fe is to install automatic block signals on the double track between Cottonwood and Daggett, a distance of 22 miles. An electric plant will be installed at Barstow to furnish power.

LOS ANGELES, CAL.—An electric railway to the top of the Montecito Hills is to be constructed by the Mutual Home Building Corporation which recently bought of the Montecito Improvement Company 200 acres in the northeast corner of the original city of Los Angeles.

OAKLAND, CAL.—The Oakland and Antioch Railway has filed a trust deed to the Anglo-California Trust Company, covering all the property of the corporation, to secure an issue of $2,000,000 worth of 30-year 5-per cent bonds. The city filed for record the release of the Stockton street railway franchise recently executed by Frank J. Stringham and his associates in the contemplated railway line.

OAKLAND, CAL.—Following the severe criticism cast upon the Oakland Traction Company by the State Railroad Commission and by the coroner's jury, which investigated the death of five persons caused by the car wreck on the California Railroad on Memorial Day, the traction company is laying a double track line and installing sidings along the right of way leading to Leona Heights. The track-laying is being rapidly pushed from the main line at East 14th street to the Boulevard, a distance of about a mile and a

PROFESSIONAL DIRECTORY

F. G. Baum & Co.
ENGINEERS and CONSTRUCTORS
Complete Hydro-Electric Power Developments
Electric Power Transmission Systems
1406-8 Chronicle Bldg. San Francisco, Cal.

Hunt, Mirk & Co., Inc.
ENGINEERS and CONTRACTORS
for complete Steam-Electric Power Plants.
141 Second St. - San Francisco

Sanderson & Porter
ENGINEERS AND CONTRACTORS
Reports, Designs, Construction, Management.
Hydro-Electric Developments.
Railway, Light and Power Properties.
New York San Francisco

H. M. Byllesby & Co.
ENGINEERS
218 LaSalle Street, Chicago, Ill.
Portland, Oregon Mobile, Alabama
Oklahoma City, Oklahoma

D. C. Jackson, C. E. Wm. B. Jackson, M. E.
D. C. and Wm. B. Jackson
Members American Institute of Electrical Engineers, American Society of Mechanical Engineers, American Society of Civil Engineers.
ENGINEERS EXPERTS
508 Commercial National Bank Bldg., Chicago, Ill.

E. F. Scattergood
CONSULTING ENGINEER
1133-1134 Central Building
Los Angeles, California

Supervision of Operation and Installations for Fuel Economy — Combustion Tests
R. F. Chevalier
CONSULTING ENGINEER
High Temperature Measurements
Fuel Analysis (Oil and Coal)
Phone Alameda 1389 — Office and Laboratory, 930 Lincoln Ave., Alameda, Cal.

A. H. Koebig
CONSULTING ENGINEER
Hydro-Electric Plants
Irrigation Plants
902-905 Broadway Central Bldg.
Los Angeles, Cal.

Smith, Emery & Co.
INSPECTING AND TESTING ENGINEERS AND CHEMISTS
651 Howard Street San Francisco

C. L. Cory
CONSULTING ENGINEER
801-802-803-804 Union Trust Bldg.
San Francisco

Manifold & Poole
CONSULTING AND SUPERVISING ENGINEERS
Electrical, Hydraulic, Mechanical, Steam
Civil, Irrigation
732-733 Central Bldg.
Los Angeles, Cal.

Rudolph W. Van Norden
CONSULTING ENGINEER
Member American Institute of Electrical Engineers
Member American Society of Civil Engineers
304-306 Union Trust Bldg.
San Francisco
Electricity, Hydraulics, Power Development
Reports and Evaluations

John S. Eastwood, C. E.
Designer of dams of the
EASTWOOD MULTIPLE ARCH TYPE
Suitable for any height or site.
Cheaper than earth dams.
Stronger than solid masonry.
Builder of the HUME LAKE DAM.
Box 663 FRESNO, CAL.

Samuel G. McMeen Kempster B. Miller
McMeen & Miller
ELECTRICAL ENGINEERS
PATENT EXPERTS
Special Attention to Telephony
1454 Monadnock Block CHICAGO
333 Grant Avenue SAN FRANCISCO

G. F. Wakefield
SURVEYOR AND ENGINEER
Hydro-Electric Power Development
Porter Building San Jose, Cal

F. C. Finkle
CONSULTING ENGINEER
Specialties:
Hydro-Electric Power Plants
Irrigation and Domestic Water Supplies
628½ South Spring Street
Los Angeles, Cal.

Phone Douglas 5877 Office, 82 Second St.
L. St. D. Roylance
Consulting and Constructing Electrical and Mechanical Engineer
Plans, Specifications and Estimates for Electric Light and Power Plants, Electrical, Mechanical and Patent Office Drawings. Tests of Dynamos, Motors, Boilers, Steam and Gas Engines.

J. G. White & Company, Inc.
ENGINEERS CONTRACTORS
San Francisco Office
Alaska Commercial Building
43 Exchange Place, New York City

A. M. Hunt
MEM. AM. SOC. C. E.
MEM. AM. SOC. M. E.
MEM. AM. I. E. E.
Union Trust Bldg. San Francisco

Straight Line Engineering Diagrams *By Manifold & Poole*
A series of twenty-five computing diagrams assembled in a handsome leather bound pocket book. Quick and accurate field determination of Pole Line Construction, Electric Power Transmission, Water Power and Pumping, Pipe Specifications, Flow in Pipes, Canals and Flumes, Bearing Power of Piles, Masonry Strength. **Price $3.00 at Technical Book Shop**
A set of Ten Supplementary Diagrams dealing with Strength of Concrete, Reenforced Concrete, Comparative Cost of Power, Economic Size of Pipe, Flow of Water in Small Pipes, and Water Measurements are now ready at the price of $1.00 for the set. These diagrams are not sold singly.

half, and the siding is being put in at Talcott Station. The work, according to the engineers of the traction company, is being done in conformity with the Interstate Commerce Commission rules, under which the California Railroad is operated.

SAN JOSE, CAL.—That no railroad construction work will be begun by the Peninsular Railway Company this summer is the statement of F. E. Chapin, general manager of that company. He says: "The report that the company is about to begin work 'closing up the gap' between Palo Alto and San Mateo is absolutely unfounded. I cannot say when work will be commenced on that line, for I do not know. It is certain, however, that it will not be this summer. We are just as anxious to extend our lines as the people are to have us extend them, and as soon as the company can see its way clear to expend the million dollars necessary to close up that little gap, it will be done. We have acquired rights-of-way over about two-thirds of the distance, but have done nothing further."

ILLUMINATION.

LOS ANGELES, CAL.—One of the improvements to be made in Central Park is to be the lighting with ornamental electroliers, seventy-two of which are to follow the course of the walks.

LOS ANGELES, CAL.—The Domestic Gas Company has been awarded a franchise by the Board of Supervisors to lay gas pipe lines over many miles of country roads in the Glendale district.

LONG BEACH, CAL.—A franchise for a conduit system for the Edison conduit which is to connect the Edison plant with the ocean was sold by the Council to the Southern California Edison Company for the sum of $200.

LONG BEACH, CAL.—T. J. Corbrey of Chicago has obtained control of the Long Beach Electrical Company, by purchasing the interest of W. H. Tidmarsh, inventor of an electrical fuse. Mr. Corbrey states that the factory will be enlarged.

LOS ANGELES, CAL.—The Huntington Beach City Trustees have asked the city attorney to take preliminary steps for calling an election to decide whether a bond issue of $40,000 shall be made for the establishment of a municipal gas plant.

CHICO, CAL.—The Pacific Gas & Electric Company, already the owner of an extensive and valuable plant in Chico, has plans under consideration for the expenditure of over $50,000 in the extension and enlargement of its gas service in Chico and suburbs.

LOS ANGELES, CAL.—The Board of Public Works has awarded the contract for 188 ornamental electroliers at a cost of $15,463 to the Llewellyn Iron Works. These poles have been paid for by the residents and property owners of Pico street from Main to Vermont avenue.

OAKLAND, CAL.—The changing of the S. P. Company's motive power on its local steam roads to electricity was assured when the City Council granted the corporation permission to electricize its Webster street Alameda mole line. The work is to be begun as soon as practicable. A provision was adopted calling for the lighting of the thoroughfare in a maner similar to the lights to be installed by the company on its new line from Fourteenth street to the bay.

LONG BEACH, CAL.—The merger of the Inner Harbor and Edison Gas Companies is now an accomplished fact. The deal, which has been pending for six months, has been worked through to a successful end by D. J. Macpherson of Pasadena, consulting engineer and one of the directors of the Inner Harbor Gas Company. The Edison people were willing to meet its competitor fairly, and it was decided that the values of the two properties and their ratio of business should each be ascertained separately and the mean ratio thus established, which should form the basis of negotiations, and this resulted in a merger of the two properties on the basis of 63 per cent for the Edison plant, franchises and business, and 37 per cent for the Inner Harbor holdings. A corporation is to be organized under the laws of the State of California to be known as Long Beach Consolidated Gas Company with an authorized capital stock of $1,500,000, of which $500,000 par value shall be 6 per cent accumulative, participating preferred stock and $1,000,000 par value common stock, the new company to take appropriate proceedings authorizing the creation of a bonded indebtedness in the sum of $1,000,000; the new company to acquire from the Southern California Edison Company its gas plant, properties, gas system and gas business within the city of Long Beach free from incumbrances, paying therefor $165,000 par value of said bonds; $85,000 par value of said preferred stock, and $425,000 par value of said common stock of the new company; the remainder of the stock and bonds of the new company to remain in the treasury of the new company.

TELEPHONE AND TELEGRAPH.

COLVILLE, WASH.—John S. Diedrich has been granted a twenty-five year telephone franchise on road No. 4, etc.

WINCHESTER, WASH.—The farmers of this section have formed a telephone company and will build considerable line.

LEWISTON, IDAHO.—The Pacific Telephone & Telegraph Company will make outside improvements and extensions to its system in Lewiston and Clarkston to the amount of $26,000.

SPOKANE, WASH.—The Pacific Telephone & Telegraph Company will spend $700,000 in improving its system in Spokane and vicinity. Thirty per cent of the amount will be spent locally.

LEWISTON, IDAHO.—The Webb Ridge Telephone Company recently organized by J. A. Ferris et al., will construct a rural line 25 miles long from Sweetwater into the Craig Mountain country. Work will proceed at once.

SPOKANE, WASH.—The Medical Lake Telephone Company has been granted a franchise to construct local lines at Medical Lake. The Star Telephone Company has been granted a franchise to operate a system at Ochlare, a new town on the Inland Empire system about two miles south of here.

SAN FRANCISCO, CAL.—In presenting his amended report on telephone rates, providing for the retention of the cheaper party-line service eliminated in the first draft of the ordinance, Chairman Laughrey of the Supervisors submitted a report from Engineer C. L. Cory, showing that the Pacific Telephone & Telegraph Company will suffer a loss of $92,185 per year in its revenue in the event that all the switches allowed under the ordinance are used by the subscribers. Secretary Bush of the Pacific company, asked to present his views of the ordinance, said that the company had desired certain changes made, but if the board could not see the wisdom of allowing them, the company would endeavor to abide its decisions, and live up to the terms of the ordinance. Supervisor Bancroft said he thought the ordinance fair to the company and fair to the city. He had been a member of the former water-rates committee, which fixed the preceding rates, at which time the Pacific Telephone & Telegraph Company had complained, just as now, that it would lose money under the schedules, but that it had, on the contrary, made money. He predicted that the same result would obtain from the present ordinance. Without further discussion, the ordinance was passed to print.

INDEX TO ADVERTISEMENTS

A

Allis-Chalmers Co. 2
Milwaukee, Wis.
San Francisco, Jackson Bldg. 2nd and Natoma.
Los Angeles, 129-131 E. Fifth.
Portland, 92 First.
Seattle, 115 Jackson.

Aluminum Co. of America
Pittsburgh, Pa.
San Francisco, Monadnock Bldg.
Los Angeles, Pacific Electric Bldg.
Seattle, Colman Bldg.

American Circular Loom Co. 20
Boston, 45 Milk.
San Francisco, 770 Folsom.
Seattle, 416 American Bank Building.

American Electrical Heater Co. 9
Detroit, U. S. A.

Aylsworth Agencies Co.
San Francisco, 165 Second.

B

Benjamin Electric Mfg. Co.
New York, 27 Thames.
Chicago, 120-128 S. Sangamon.
San Francisco, 151 New Montgomery.

Blake Signal and Mfg. Co.
Boston, 246 Summer.

Bonestell & Co. 3
San Francisco, 118 First.

Brookfield Glass Co., The 1
New York, U. S. Exp. Bldg.

Buxbaum & Cooley
Seattle, 69 Columbia St.

C

Cal. Incandescent Lamp Co. 3
San Francisco, 633 Howard.

Century Electric Co. 13
San Francisco, 633 Howard.

D

D. & W. Fuse Co. 13
Providence, R. I.

Davis, R. J. 13
San Francisco, 633 Howard.

Dearborn Drug & Chem. Works 12
Chicago, Postal Bldg.
San Francisco, 301 Front.
Los Angeles, 355 E. 2d.

Duncan Elec. Mfg. Co.
Lafayette, Indiana.
San Francisco, 61 Second.

E

Electric Goods Mfg. Co.
Boston, Mass.
San Francisco, 165 Second.

Electric Storage Battery Co. 3
Philadelphia, Pa.
San Francisco, Monadnock Bldg.

F

Fort Wayne Electric Works 5
Fort Wayne, Ind.
San Francisco, 604 Mission.
Seattle, Colman Bldg.

G

General Electric Co. 16-17-18-19
Schenectady, N. Y.
San Francisco, Union Trust Bldg.
Los Angeles, Delta Bldg.
Seattle, Colman Bldg.
Portland, Worcester Bldg.
Atlanta, Ga.
Baltimore, Md.
Boston, Mass.
Buffalo, N. Y.
Butte, Mont.
Charleston, W. Va.
Charlotte, N. C.
Chicago, Ill.
Cincinnati, O.
Cleveland, O.
Columbus, O.
Denver, Colo.
Detroit, Mich.
Indianapolis, Ind.
Kansas City, Mo.
Minneapolis, Minn.
Nashville, Tenn.
New Haven, Conn.
New Orleans, La.
New York, N. Y.
Philadelphia, Pa.
Pittsburg, Pa.
Richmond, Va.
Salt Lake City, Utah.
St. Louis, Mo.
Spokane, Wash.
Syracuse, N. Y.

Goeriz, O. C. & Co. 13
San Francisco, 916 Postal Tel. Bldg.

H

Habirshaw Wire Co. 11
New York, 253 Broadway.

Henshaw, Bulkley & Co. 1
San Francisco, 19 Fremont.
Oakland, 1436 5th.
Los Angeles, 262 S. Los Angeles.

Hitchcock Military Academy, The
San Rafael, California.

Holtzer-Cabot Elec. Co., The 4
Boston and Chicago.
San Francisco, 612 Howard.

Hughes & Co., E. C. 5
San Francisco, 147-151 Minna.

Hunt, Mirk & Co. 6
San Francisco, 141 Second.

I

Indiana Rubber & Ins. Wire Co. 1
Jonesboro, Indiana.

J

Johns-Manville Co., H. W. 5
New York, 100 William.
San Francisco, 159 New Montgomery.
Los Angeles, 203 E. 5th.
Seattle, 576 1st Ave. So.

K

Kellogg Switchb'd & Supply Co.
Chicago.
San Francisco, 88 First.

Kierulff, B. F. Jr. & Co. 9
Los Angeles, 120 S. Los Angeles.

Kiewert, Chas. L. Co. 13
San Francisco, 195-7 Fremont.
Los Angeles, 225 Franklin Court.

Kilbourne & Clark Company
Seattle, 307 First Ave. So.

L

Lindsley-Wright Co. 12
Portland, Ore., 336 Sherlock Bldg.

Locke Insulator Mfg. Co. 4
Victor, N. Y.
San Francisco, Monadnock Bldg.
Los Angeles, Pacific Electrical Bldg.
Seattle, Colman Bldg.

M

Moore, C. C. & Co., Inc. 3
San Francisco, 99 First.
Los Angeles, American Bank Bldg.
Seattle, Mutual Life Bldg.
Portland, Wells-Fargo Bldg.
Salt Lake City, Atlas Blk.
New York City, Fulton Bldg.

N

New York Insl'td Wire Co. 4
New York, 114 Liberty.
San Francisco, 770 Folsom.
Seattle, 416 American Bank Bldg.

O

Ohio Brass Co.
Mansfield, Ohio.
San Francisco, Monadnock Bldg.
Los Angeles, Pac. Electric Bldg.
Seattle, Colman Bldg.

Okonite Co. 1
New York, 253 Broadway.

P

Pacific Electric & Mfg. Co. 9
San Francisco, 80 Tehama.

Pacific Gas & Elect. Co., The 15
San Francisco.

Pacific Meter Co. 1
San Francisco, 311 Santa Marina Bldg.

Pacific Tel. & Tel. Co., The
San Francisco.

Partrick Carter & Wilkins Co. 12
Philadelphia, 22d and Wood

Pelton Water Wheel Co., The 9
San Francisco, 1095 Monadnock Bldg.

Phillips Insulated Wire Co. 1
Pawtucket, R. I.

Pierson, Roeding & Co. 4
San Francisco, Monadnock Bldg.
Los Angeles, Pac. Electric Bldg.
Seattle, Colman Bldg.

Portland Wood Pipe Co.
Portland, Ore.

R

Reisinger, Hugo
New York, 11 Broadway.

S

Schaw-Batcher Co. Pipe Works 5
Sacramento, Cal., 211 J St.
San Francisco, 356 Market.

Simplex Elect'l Co., The
Boston, 110 State.
San Francisco, 612 Howard.
Los Angeles, Security Bldg.
Seattle, Alaska Bldg.
Portland, Couch Bldg.

Simplex Electric Heating Co. 4
Cambridge, Mass.
San Francisco, 612 Howard.
Los Angeles, Security Bldg.
Seattle, Alaska Bldg.
Portland, Couch Bldg.

Southern Pacific Co. 14
San Francisco, Flood Bldg.

Sprague Electric Co. 15
New York City, 527-531 W. 34th.
San Francisco, Atlas Bldg.
Seattle, Colman Bldg.

Standard Und. Cable Co. 1
San Francisco, First National Bank Bldg.
Los Angeles, Union Trust Bldg.
Seattle Office, Lowman Bldg.

Star Expansion Bolt Co. 9
New York City, 147-149 Cedar.

Sterling Paint Company, 12
San Francisco, 118 First.

Swayne, R. B. 9
San Francisco, 813 Postal Telegraph Bldg.

T

Technical Book Shop 9
San Francisco, 604 Mission.

Tel. & Elec. Equip. Co.
San Francisco, 612 Howard.
Los Angeles, Security Bdg.
Seattle, Alaska Bldg.
Portland, Couch Bldg.

Thomas and Sons Co., R. 11
New York, 227 Fulton.
East Liverpool, Ohio.

Tracy Engineering Co. 9
San Francisco, 461 Market.
Los Angeles, Central Bldg.

V

Vulcan Iron Works 1
San Francisco, 604 Mission.

W

Western Electric Co. 22
San Francisco, 680 Folsom.
Oakland, 507 16th.
Los Angeles, 119 E. 7th
Seattle, 1518 First Ave. So.

Western Wireless Equipment Co. 9
San Francisco, Grant Bldg, 7th and Market.

Westinghouse. Elec. & Mfg. Co. 6
Pittsburg, Pa.
Los Angeles, 527 So. Main.
Denver, 429 17th.
Seattle, Central Bldg.
Salt Lake City, 212-214 So. W. Temple.
San Francisco, 165 2d.
Spokane, Columbia Bldg.
Portland, Couch Bldg.
Butte, Lewisohn Bldg.
Canada, Canadian-Westinghouse Co., Ltd., Hamilton, Ontario.
Mexico, G. & O., Braniff & Co., City of Mexico.

Westinghouse Machine Co. 6
Pittsburg, Pa.
San Francisco, 141 Second.

Weston Elect'l. Instrument Co. 20
Waverly Park, N. J.
New York, 114 Liberty.
San Francisco, 682-684 Mission.

Wilbur, G. A.
San Francisco, 61 Second.